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THE LATEST BRITISH WAR SHIPS.

The Collingwood, of which we obtain the accompanying illustration from the *Illustrated London News*, is one of the newest British war ships, in which the idea is rather to make a floating fort than one of the old style ironclads. She has a displacement of 9,150 tons and engines of 7,000 horse power, is built of steel and plated with armor ten inches thick, and carries ten guns. She is the first of a series of regular barbette ships being built for the British navy, and is a representative of the Admiral type, named after distinguished British naval commanders, several others of the same class now being under construction in the government dockyards and by the Thames Iron Shipbuilding Company. Not only, however, is the Collingwood a new vessel of a distinctly novel type, but her armament has a new gun, with a new system of breech mechanism, actuated by a new application of hydraulics, and the gun is mounted and protected on an entirely new plan.

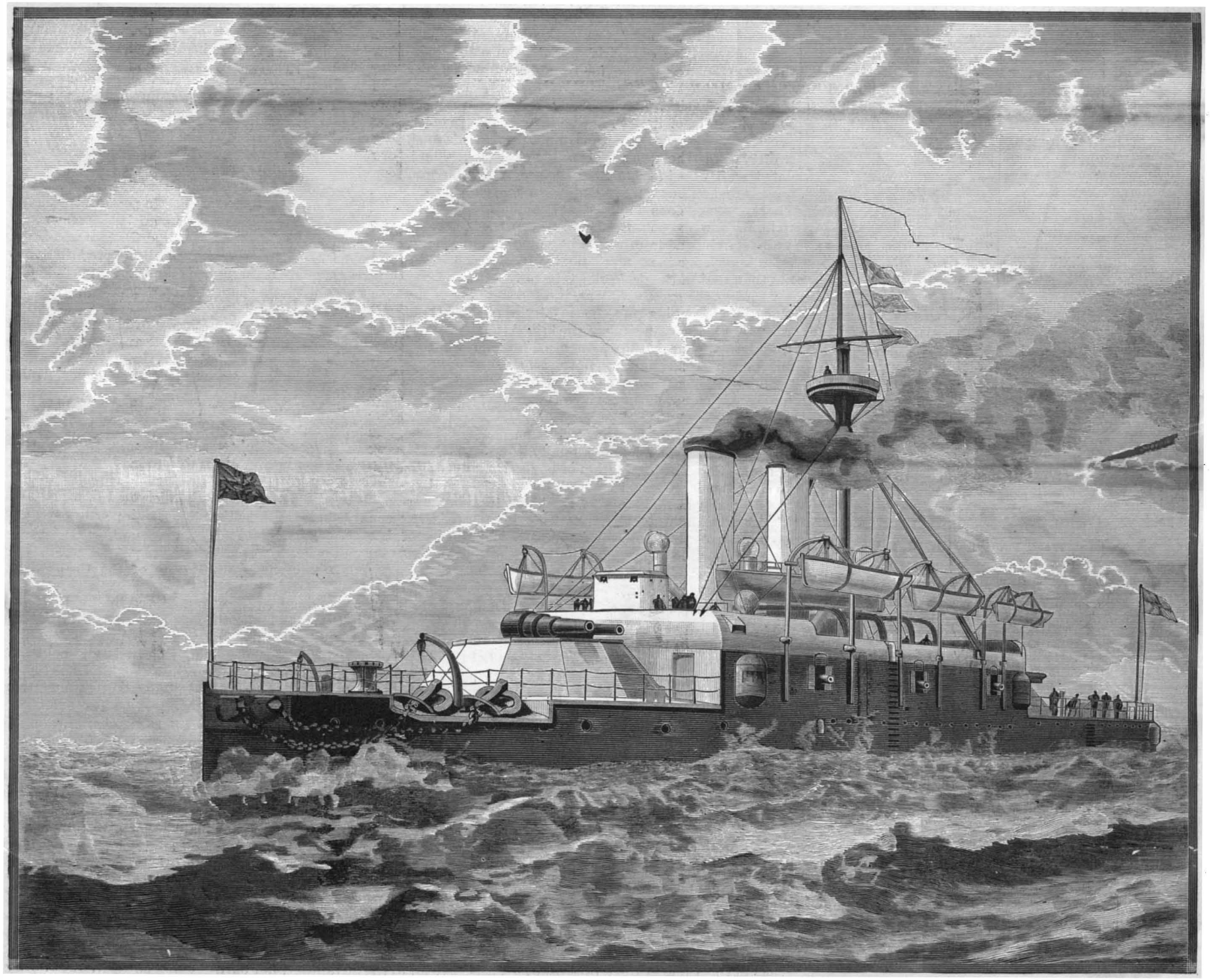
From the great height of the parapets above the water line, the barbette arrangement enables a powerful plunging fire to be directed against an enemy, and makes it possible for the guns to be worked under conditions of sea which would silence those of the Inflexible. The new system is advocated by its patrons also on the ground that it enables the gunner to see the enemy better, and to follow his movements more satisfactorily, so as to be able to strike him at the first favorable moment. But some critics of the new system have remarked that with it the object can be followed only by means of side-sights, and is completely hidden by the gun in the important moment of its being laid. An experimental trial of the Collingwood's armament and mode of working her guns took place on March 5, in presence of the Naval Lords of the Admiralty, the principal dockyard officials, and the Ordnance Committee. Two 43 ton guns were fitted on the barbettes erected at each end of the superstructure battery, along the middle line of the ship, their parapets being at an elevation of 19 feet 3 inches and 20 feet 3 inches respectively above the water. The barbettes are egg-shaped, and are formed of steel-faced armor, 14 inches and 12 inches thick, with a steep inward slope to secure the glancing of the shot when struck.

Communication with the magazine is obtained by means of an armored tube, up which the cartridges and shot are brought. The guns are mounted on a turntable, similar to those used on railroads, rotating on conical rollers. The diameter of the table is 24 feet, so that the guns cannot be brought within the protection of the barbette; when the breech is depressed for loading, the muzzles are dangerously elevated; and when the guns are run out for firing, they are protruded beyond the side. The top of the barbette is protected as far as possible by 3 inch plating flush with the parapet; outside is a circular gallery which serves the double purpose of forming a pathway round the barbette and a breakwater against the shipping of seas. The experimental firing of the guns, 24 rounds in all, single and double firing, was so far satisfactory as it proved that the barbettes and adjacent parts of the ship could bear the strain well.

How to Separate Lenses.

The two lenses of an achromatic object glass are cemented together with Canada balsam, the volatile part of which passes away, after a time, and it frequently happens that air or moisture, taking the place of this, gives an iridescent appearance to the glass and interferes with correct delineation. To remedy this fault it becomes necessary to separate and clean the two lenses and readjust them, cementing with Canada balsam, as before. Hitherto it has been customary, in order to effect the separation, to apply heat, and however carefully this may be done, it sometimes happens that a lens is thereby cracked. All risk of fracture may be avoided by placing the achromatic combination in a small quantity of benzole or naphtha (from coal tar) within a covered vessel, either of which hydrocarbons will, in a day or two, dissolve away or soften the hardened cement without heat. The same liquid will remove the last traces of resinous matter.

THE oldest architect in the United States, Mr. William Tinsley, of Cincinnati, died recently in that city, at the age of eighty-one.



NEW STEEL ARMOR-PLATED BARBETTE SHIP COLLINGWOOD, OF THE BRITISH NAVY—9,150 TONS, TEN GUNS.

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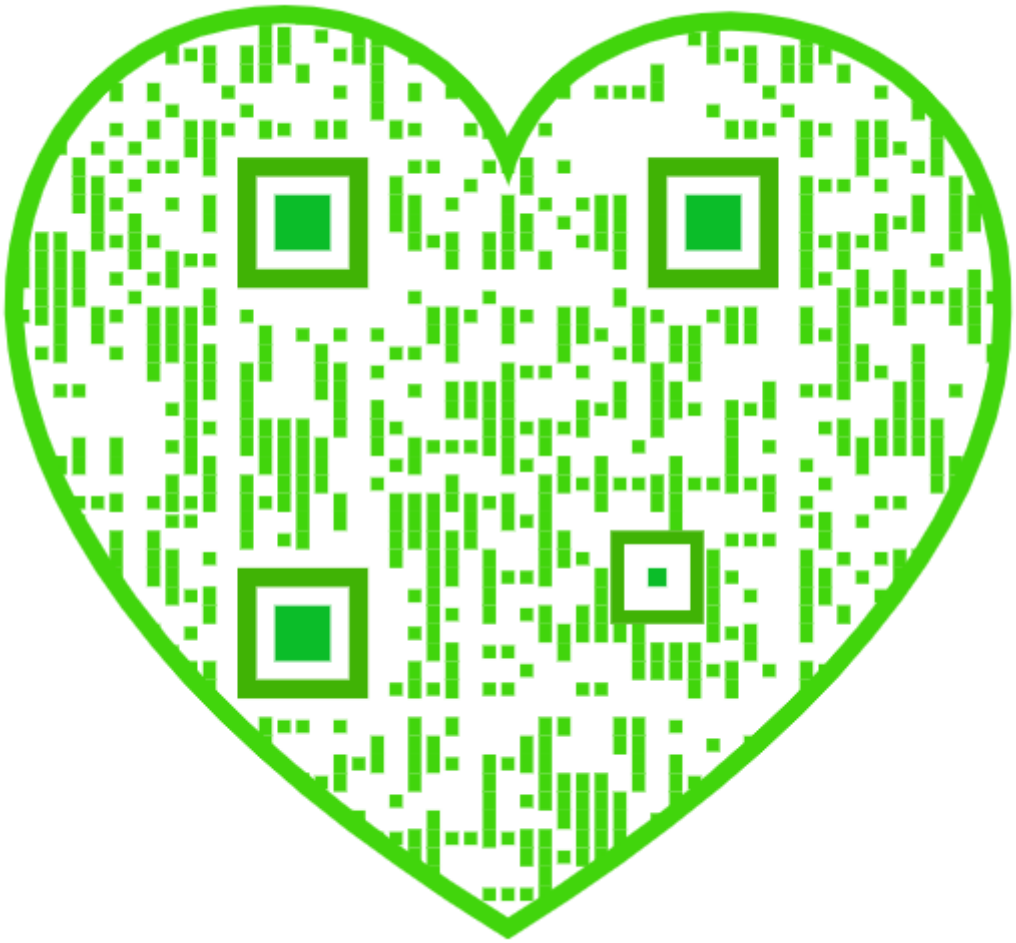

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ANOTHER TELEPHONE DECISION.

The latest phase of the telephone litigation was developed at Pittsburg, Pa., July 8, in the U. S. Court, before Judge McKinnon, in the suit of the Bell Telephone Co. against the Western Telephone Co., for infringement and injunction. The court permitted the cousel for the Bell Co. to occupy almost an entire day with their argument, but refused to hear any reply on behalf of the defense, although they were prepared to prove that their invention was substantially the same as that used by Reis, many years prior to Bell's alleged invention. At first the court was inclined to hear of this matter, as the issue hinges entirely upon the question whether or not the Reis transmitter will transmit speech regardless of the kind of receiver used; but finally it refused to hear evidence, allowing that to go over to the final hearing. The court, however, held that the questions at issue had been decided recently by Judges Gray and Wallace, and that it would not, in the matter of a preliminary injunction, venture to decide contrary to the opinions of those eminent jurists.

The practical effect of this decision is that the use of the Reis telephone is an infringement of the Bell patent—a position which we have expected the lower courts would sooner or later take, since in no other way can the gigantic Bell monopoly be upheld. The moment justice is done, and the use of Reis' invention allowed, the patent of Bell will be reduced to its proper rank—that of a subordinate improvement. None of the Bell telephone litigations have reached decision by the Supreme Court. If the latter tribunal deals with the Bell patent in the same manner that it has with other wide reaching monopolies, the claims of the Bell people will, in due time, be greatly modified.

HOUSE KNOWLEDGE FOR BOYS.

The Governor of Massachusetts, in an address before the Worcester Technical School, June 25, said some words that are worthy of noting. He said: "I thank my mother that she taught me both to sew and to knit. Although my domestic life has always been felicitous, I have, at times, found this knowledge very convenient. A man who knows how to do these things, at all times honorable and sometimes absolutely necessary to preserve one's integrity, is ten times more patient when calamity befalls than one who has not these accomplishments."

A commendation of "girls' work" from such an authority emboldens the writer to add a word in favor of teaching boys how to do work that may be a relief to a nervous, sick, worried, and overworked mother or wife, and be of important and instant use in emergencies. A hungry man who cannot prepare his food, a dirty man who cannot clean his clothes, a dilapidated man who is compelled to use a shingle nail for a sewed-on button, is a helpless and pitiable object. There are occasions in almost every man's life when to know how to cook, to sew, to "keep the house," to wash, starch, and iron, would be valuable knowledge. Such knowledge is no more unmasculine and effeminate than that of the professional baker.

"During the great civil war, the forethought of my mother in teaching me the mysteries of household work was a 'sweet boon,' as the late Artemus Ward would say. The scant products of foraging when on the march could be turned to appetizing food by means of the knowledge acquired in boyhood, and a handy use of needle and thread was a valuable accomplishment."

Circumstances of peculiar privation compelled the writer, as head of a helpless family, to undertake the entire work. The instruction of boyhood enabled him to cook, wash, starch, iron, wait on the sick, and do the necessary menial labor of the house in a measurably cleanly and quiet manner. This knowledge is in no way derogatory to the assumptive superiority of the male portion of humanity; a boy who knows how to sweep, to "tidy up," to make a bed, to wash dishes, to set a table, to cook, to sew, to knit, to mend, to wait on the sick, to do chamber work, is none the less a boy; and he may be a more considerate husband, and will certainly be a more independent bachelor, than without this practical knowledge. Let the boys be taught housework; it is better than playing "seven-up" in a saloon.

THE NORMAL CONCERT PITCH.

At a large meeting of musicians held in London on June 21, a resolution was passed in favor of the adoption of a normal pitch of 518 double vibrations for the treble.

For a number of years it was noticed that the concert pitch not only was becoming higher, but that it was far from uniform in the different European capitals. This was naturally a source of great inconvenience and annoyance to both singers and composers, and a movement was started in France fully twenty-five years ago to secure a tuning fork of uniform pitch, which should be a standard for the entire musical world. The standard tuning fork deposited at that time in the Conservatory of Music at Paris gave 437·5 double vibrations, corresponding to *A* or *la* in the treble stave. Consequently *C* or *do* of the treble would result from 522 double vibrations. In England, the Society of Arts recommended that this note should be represented by 528 double vibrations, a number having the advantage of being divisible down to 33, which is a quality of some importance, since each descending octave has but half the vibrations of its superior stave.

The new standard of 518 double vibrations for the treble *C* or *do*, if the cablegram has reported it correctly, permits but one division, giving 259 double vibrations for the middle *C* of the scale. The succeeding lower octaves must therefore all be represented by fractional vibrations.

SINGLE LIPPED DRILLS.

There is known to some machinists a peculiar drill known as the "cannon" drill, the "half-round" drill, and the "half lip" drill, according to the prevailing nomenclature of locality. But all these drills depend for their centering and line on some guide outside themselves; they must be guided by center and slide like a boring tool that works in an already formed and possibly irregular hole.

Another drill is really a cutting tool composed of a guiding center, which is the drill proper, and two wings of rotating cutting edges. This is known as the "pin" drill, the "teat" drill, and the "flange" drill; in fact, it is an untwisted auger adapted to metals instead of wood. If pressure alone induced the auger to penetrate the wood, without the aid of the threaded screw point, and the wood chips did not clog, the pin drill would be a good wood auger. The auger, by means of its threaded point, is pulled into the wood, but the drill must be forced to its work. With this difference the auger and the drill are very similar.

The writer has in possession and use an "expansible bit" which will bore a hole from five-eighths of an inch diameter—its normal size—to one of two inches diameter—its extreme limit. The expansion is made by means of a sliding blade that may be secured at any point desired. This is a single blade (not two on either side the center), and it is surprising how fast this single cutter works, cutting a clean hole, the bit itself being merely a central shaft around which the one wing of a cutter swings. The tool is suggestive, and it was thought that if a self-progressing tool like an auger could keep its center with one blade, why could not a forced tool like a drill also keep its place with one cutting blade—in short, why is it necessary to make all drills with double lips? It is quite evident that where two lips are to be ground exactly alike to form a center, there must be very exact work to preserve the changing center to conform with the double circumference—or radii. If the center was fixed, a single cutting wing could be easily adapted to size.

A favorable chance gave opportunity to test the possibility of a single lipped drill. In passing through a shop it was noticed that a workman broke one of the blades of a "lip" drill or "teat" drill. He was about to have it reforged, when he was allowed to grind away the fragments remaining from the broken portion, and use the drill with a single lip or wing. It worked admirably; cut as rapidly as when there were two lips, and as a proof of its superiority over the two lipped drill the terminal burr came out clean, instead of having an inner circumferential ridge. It is noticed that the burr or the last clean cut of the "teat" drill is a disk, the last of the drill's work. This disk is rarely a smooth one, but if examined it will be found to have two circumferences, one inside the other, that show that the two cutting edges do not act uniformly; in short, that it is difficult to grind a drill to center. Perhaps a single lip drill would be an improvement on our double lip drills in many cases. It certainly would be when there could be used a projecting and guiding center such as is necessary to "teat" drills.

The "Novelties" Exhibition of the Franklin Institute.

The pronounced success achieved by the Electrical Exhibition held under the auspices of the Franklin Institute, Philadelphia, last year has probably been a principal inducement moving that society to hold this year what is styled a "novelties" exhibition, in the well situated and capacious buildings and grounds that were utilized for last year's display. The exhibition will be open from September 15 to October 31, and exhibitors will be charged $2 for ten square feet of space, with 10 cents more for each additional square foot. Applications must be made before September 13, and those already received give promise that the exhibition will be one of unusual interest. All applications for space should be made on blanks that give full particulars, and will be furnished on addressing the Committee on Exhibitions, Franklin Institute, Philadelphia.

Nickel Crucibles.

Crucibles of nickel have lately been adopted in some chemical laboratories, in the place of the silver ones generally used for melting caustic alkalies. They have the advantage, not only of being cheaper, but of being capable of resisting a higher temperature than the latter, and the result is said to be favorable.

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Electrical Studies at Cornell University.

The course in electrical engineering in Cornell University has now been established for two years, and is already well patronized. It requires four years of study for its completion, the object, writes Prof. W. A. Anthony in the *Electrical World*, being to turn out, not electricians or electrical engineers merely, but educated men. To enter it students must have a knowledge of the common English branches and a part of algebra and geometry. In the university they pursue the mathematics through calculus, study the French or the German language, give some time to the study of English, devote several terms to the theory and practice of machine drawing, pursue for final terms the study of mechanics as applied to engineering, besides the work in general physics and electricity, which occupies a considerable portion of the time for three years.

As to equipment, the physical department of the university, where the study of electricity is pursued, is supplied with very complete arrangements for the experimental study of electrical science and its applications. The best instruments for electrical measurements are at hand, and students have practice in measuring resistances of conductors, of batteries, and of instruments. They learn to test the accuracy of the instruments they employ. They measure electromotive forces by the quadrant and absolute electrometer as well as by various other means. There are four dynamo machines under charge of the department, besides several lecture room models and electromotors. Students make complete measurements and tests of these, and make constant use of them for various experiments. For instance, one student has been experimenting since last winter upon the effect of the various kinds of covering upon the rise of temperature of wires heated by electric currents; another has been comparing the different photometric methods as applied to the measurement of the illuminating power of arc lamps; another has been comparing the deposits of copper in voltameters having different sizes of plates, in neutral and acid solutions, in solutions of different degrees of concentration. Currents of various strengths from 1 to 18 amperes were employed. Silver voltameters were also compared with copper.

There is just now being completed a "magnetic observatory" for furnishing facilities for magnetic experiments and electrical experiments that depend upon the uniformity of the magnetic field around the instrument.

Iron has been rigidly excluded from the construction of the building. Here will be mounted the instruments for determining the elements of the earth's magnetic field, but the principal instrument is an enormous tangent galvanometer on the Helmholtz plan, capable of measuring currents from one one-hundredth ampere to 200 amperes. The conductors for heavy currents are three-quarter inch copper rods. The deflections of the needle are read on a graduated circle 50 inches in diameter, and a suspended coil 1 meter in diameter, of 100 turns of wire, furnishes the means of determining the horizontal intensity of the earth's field at the exact place of the instrument at any moment, by observations requiring but a few minutes.

This observatory is placed so far from any of the other buildings as to be free from any magnetic disturbance from moving masses of iron. It is connected with the laboratory by several wires, among which is a pair of 0000 copper, for conveying the heavy currents. In connection with this equipment, and as accessory to the large tangent galvanometer, is a set of German silver resistances, consisting of 36,000 feet of No. 16 wire in sixty sections of 600 feet each, connected to switches that permit of combinations in series, or multiple arc, or "multiple series," in all desirable ways. They give a variety of resistances from three-fifths ohm to 1,800 ohms.

The large tangent galvanometer has been constructed at the university, and it is proposed to construct next year a standard potential instrument to permit of the accurate measurement of all potentials.

All these instruments will be used by students as they have occasion. During this year several small dynamos and motors have been tested here, the students taking part in the work, and it is proposed in the future to continue this work of testing upon larger machines as opportunity offers.

Professor Thurston Goes to Cornell.

At their recent meeting, the trustees of Cornell University decide to tender to Professor Thurston, of the Stevens Institute of Technology, the position of presiding officer and "director" of Sibley College; which, as our readers are well aware, is the School of Mechanical Engineering of the University. The liberality of the Hon. Hiram Sibley, of Rochester, has recently provided this college with larger buildings, extended workshops, and increased facilities for the carrying out of the plans of the founder of the University and of the trustees. The collections have been enlarged, and it is proposed to considerably extend the scope of the school. The course will be broadened, the faculty enlarged, and the shop work and mechanical laboratory work, as well as courses of instruction involving research, greatly extended. The trustees propose to make this department as prominent and as complete, in every respect, as its position in a university avowedly intended to be an institution of practical as well as theoretical, scientific, and literary character should justify them in making it. The new director, and the faculty who aid him, enter upon their work with the strongest possible pledges of hearty support, not only from the trustees, but from all real friends of the university who have been consulted.

It is not known who is to succeed Professor Thurston at Hoboken, but it is anticipated that it will be a distinguished member of the engineering profession, as well known by his long professional services as by his ability and by his success as a writer on mechanical and engineering topics.

Refrigerators.

When the hot season begins the annual inquiry comes, "What is the best refrigerator?" The requirements are easy to state. It must be so constructed as to perfectly preserve any article of food that is put in it, in such a manner that it not only will not decompose, but that the most sensitive substance that may be put in cannot be contaminated by the odor, be it good or bad, of any other article, and all this without wasting the ice.

It may be said, then, there must be a circulation of pure, cold, dry air.

The outer air must be guarded against, both in the provision chambers and ice chamber, and the waste pipe conveying the drippings from the ice should be so constructed that no foul air is admitted from the sewer or waste pipe with which it is connected.

Refrigerators requiring chopped ice, thereby obtaining a greater degree of cold from the greater ice surface exposed, are wasteful.

The degree of cold required is not as low as is generally imagined, and if kept too cold some sensitive substances may be injured. A temperature averaging 40° Fah. is, according to the New York *Analyst*, the best.

And ventilation, according to the same authority, is not required. The action of the warmer air passing around the ice and displacing the colder air creates, by the current thus established, sufficient ventilation.

A good refrigerator must be so constructed as not to contain any material easily corroded, stained, or absorbent, and that every portion of it can be easily cleaned; for cleanliness is as important, if not more so, to the preservation as temperature.

It should be so constructed that the gases from one portion of the provision chamber cannot pass into any other part excepting the ice chamber, else the food may spoil, even though the temperature is maintained.

The temperature must be maintained at an even point.

Experimental Ballooning.

Important experiments in aerial navigation are now being made by Mr. A. F. Gower, well known in connection with the Gower-Bell telephone. The operations being carried on are, it is understood, within the cognizance of the Government, and are more particularly directed toward the adaptation of balloons to war purposes. Several ascents have already been made, and in carrying out his arrangements Mr. Gower appears to have recognized the advantages offered by the position of the town of Hythe, which he has made the center of his operations. On the 31st of May, the wind being favorable, one of the automatic pilot balloons invented by Mr. Gower, with appliances for giving out its own gas and ballast, one compensating for the loss of the other, was filled with 2,300 feet of gas, and ascended at about 11 o'clock. In the car a written statement was, of course, placed, explaining the ownership of the machine and its object, with the result that it was next heard of at Dieppe, having made a rapid passage of about seventy-two miles in a straight direction and descended at 2:30 in the afternoon. On June 1, another pilot balloon, with a capacity of 4,300 feet, was started, and immediately followed by Mr. Gower in his own balloon (containing 23,000 feet of gas). The object of Mr. Gower in ascending was to watch the action of the pilot; but the smaller machine made such rapid progress that it got out of his observation, and came down in the vicinity of Paris. Meanwhile Mr. Gower, who ascended about noon, took the French coast at Boulogne at 2:15, and then taking a northerly curve traveled overland to Calais, where he made a smooth descent at 4 P.M. A still more important undertaking, was, however, entered upon on June 3, when Mr. Gower, Captain Lane, and Mr. Dale, the aeronaut, ascended in a balloon of 40,000 feet capacity. A good start was made, and the aerial voyagers sailed away in a northerly direction. After a journey of rather more than an hour, they were compelled to descend, owing to the wind taking a slight turn toward the North Sea, and with much difficulty landed on the Isle of Sheppey, having traveled twenty-three miles.—*Nature*.

Salt as a Destroyer of the Teeth.

At a recent meeting of the New York Odontological Society, Dr. E. Parmly Brown said:

I will venture the assertion that the excessive use of common salt is one of the main factors in the destruction of human teeth to-day. I am now engaged in collecting some statistics on this point, from which I hope in time to demonstrate, what seems to me to be the fact, that common salt excessively used is a great solvent of the human teeth. If it will injure the human teeth through the chemistry of our systems in some way or other that I will not try to explain to-night, why might it not also have the effect of preventing a good development of the teeth when taken into the system in excess? I have lately procured some statistics from the Sandwich Islands, from a gentleman who has been there, covering a period of over forty years, that are very suggestive and interesting. Within that period the teeth of the Sandwich Islanders have decayed rapidly, and since they have begun to decay it has been noticed that the natives are in the habit of biting off great chunks of salt and eating it with their food. According to all accounts, the teeth of the Sandwich Islanders were formerly the most free from decay of any people on the face of the earth, if I remember rightly. You will find that people who eat a great deal of salt and a great deal of sugar are often entirely toothless. I know several instances of candy storekeepers where three generations are entirely toothless. People who eat an excessive amount of salt are tempted to eat large quantities of candy, pickles, and vinegar. There seems to be a craving for those substances after the excessive use of salt.

Compulsory Drawing.

As amatter of fact, in the practical crafts by which the bulk of the people gain a living, a knowledge of simple drawing is of more substantial importance than the ability to write; and as a lad who can write better than his school fellows stands a better chance than they of getting a berth in a counting house, so another who can draw even a little will make a better carpenter than those who cannot draw at all. Rather late in the day we have found this out. The discovery was the mainspring of the system of national art training; the knowledge of it is the impelling force of the great movement for technical instruction which is now in full swing. So long as the industrial prosperity of England depended merely upon the spread of railways, the multiplication of steamships, the stream of splendid mechanical inventions, and the increased quantity and cheapness of production which resulted therefrom, the influence of elementary art teaching upon manufacturers and upon national taste could be ignored, and to the great loss of this country it was ignored. But that state of things has almost wholly passed away. Our Continental competitors nowadays buy our machinery, or themselves make as good; and the pinch of competition is felt at this time not merely in the cost but also in the taste of production. The great nations of Europe had a sharper eye to the future than we. For thirty years have they devoted themselves to this question of elementary art teaching; and in nearly all the elementary schools of the Continent drawing is not merely taught, but is, and for long has been, compulsory. And the results are so striking, so beneficial throughout the range of industry and manufacture, that our own Royal Commission appointed to inquire into the facts some years ago, when the truth could no longer be gainsaid, has just recommended that drawing should be "incorporated with writing as a single elementary subject," compulsory in all primary schools, and that it should be continued throughout the standards.—*Magazine of Art*.

A Shoal Water Alarm.

A curious invention especially designed for navigating the Nile, but which is applicable to other rivers, has been brought out by Messrs. Yarrow, of London. The object of the invention is to notify the pilot of the existence of sand banks or rocks lying directly in his pathway. The invention consists of two poles projecting about fifty feet ahead from the post and starboard sides, at the ends of which are suspended two vertical iron rods. The bottom extremities of these come about one foot below the level of the boat itself. Attached to each of these two vertical iron rods is a wire rope which passes inboard, and is connected with the whistle on the boiler; and the gear is so arranged that immediately this indicator touches a rock or sand bank, it instantly causes the steam whistle to blow. This plan in the first instance draws the pilot's attention to the fact, and also points out to him on which side of the steamer the sand bank or rock exists, so that it gives him warning in which direction to steer.

Henry H. Gorringe.

Lieutenant-Commander Gorringe, of the U. S. Navy, who brought the Egyptian obelisk to New York in 1880, died July 6, as the result of spinal injuries received by jumping from a moving train some time ago.

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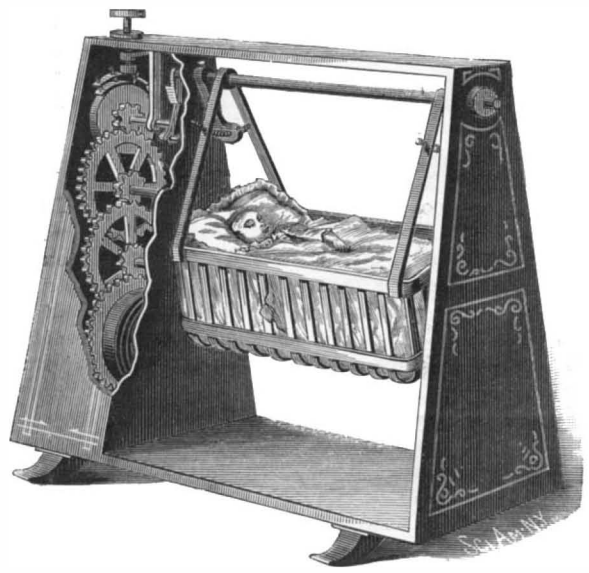
AUTOMATIC ROCKING CRADLE.

The supporting frame for the rock shaft, from which the cradle is suspended and rocked, consists of a broad base plate with uprights a suitable distance apart, for hanging the cradle between them, and an upper cross plate for staying the uprights at the top. At one end of the frame is a case inclosing a coiled driving spring and a suitable multiplying and transmitting train of gear wheels, and pinions connecting the spring with a crank shaft located in the upper part of the case. This crank carries a rod working in a sleeve on the crank of the rock shaft, so arranged that the rotation of the crank shaft will cause a rocking motion of the main



ANDERSON'S AUTOMATIC ROCKING CRADLE.

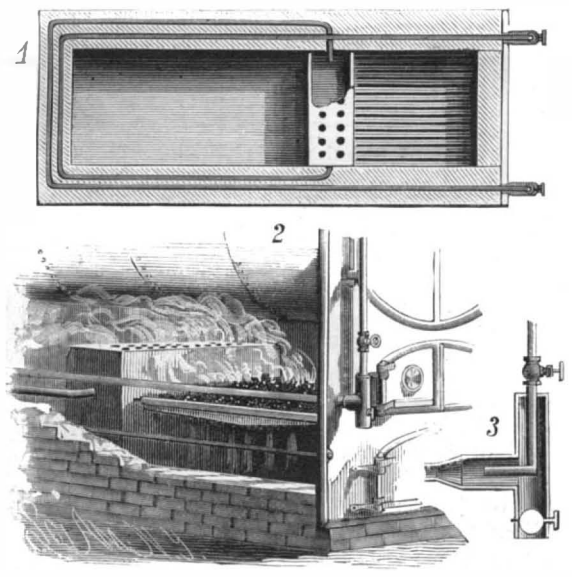
shaft. The speed can be regulated by a friction brake in connection with a disk fitted on the crank shaft; the brake is operated by an adjusting screw extending down through the top of the case. Between the brake shoe and an upper bar are placed coiled springs, the elasticity of which prevents the brake from stopping the cradle too abruptly. To prevent a jerky motion of the cradle when the crank passes the center, the cradle arms are hung loosely on the rock shaft, while the driving arms are rigidly secured to the shaft by set screws, and act against springs fitted on a rod extending from one to the other of the arms of each end of the cradle; the springs form buffers which relieve the cradle of any shocks that might otherwise be imparted to it by the quick action of the crank. Access to the driving mechanism is afforded by a door in the top of the case.

This invention has been patented by Mr. Edward Anderson, of 567 South Morgan St., Chicago, Ill.

DEVICE FOR FEEDING AIR TO FURNACES.

The object of the invention herewith illustrated is to provide attachments for furnaces, by the use of which the draught can be regulated and the gases formed from the coal can be wholly consumed. Fig. 1 is a sectional plan view, Fig. 2 is a perspective view of part of the furnace and boiler, and Fig. 3 is a section of a T-head, showing the pipes connected with it.

With any part of the steam space of the boiler are connected the ends of two pipes, which extend forward to the front of the furnace and then down to the level of the upper part of the fire chamber, at which points they



WRIGHT'S DEVICE FOR FEEDING AIR TO FURNACES.

enter the upper arms of the T-heads, and are bent at right angles to discharge steam into the horizontal arms of the heads.

The connection between the upper arms of the heads and the steam pipes is made steam tight, and the lower arms of the heads are provided with valves, so that the entrance of air can be readily regulated. The steam pipes are furnished with valves a little above the heads, by which the admission of steam can be regulated. The horizontal pipes of the heads are embedded in the walls of the furnace and extend to the rear end of the furnace, pass through the end wall and through the side walls, and terminate in a chamber formed in the rear side of the bridge wall. The air chamber is covered with slabs of fire brick, finely perforated, so that the contents of the chamber will be discharged in fine streams into the products of combustion as they pass over the bridge wall.

By this plan steam or air, or steam and air, in any desired proportions can be introduced into the furnace in any quantity to regulate the draught and consume the gaseous products of combustion, so that the fuel will be entirely consumed and the greatest possible amount of heat created. The air and steam entering the furnace, being superheated, will have no tendency to lower the temperature, and all the heat produced will be utilized.

This invention has been patented by Mr. William Wright, of 262 W. 22d St., New York city.

A New Stain from the Huckleberry.

BY ALBERT E. JENKINS, ANN ARBOR, MICH.

In volume xxiii. of the *Archiv fur Mikroskopische Anatomie*, Dr. Lardowsky describes a new stain, which he highly recommends for the karyokinetic figures and the cellulose walls of plants.

The fresh ripe fruit of the huckleberry, *Vaccinium myrtillus*, is washed in water, and the juice expressed and mixed with twice its volume of distilled water, to which a trace of alcohol has been added. It is then boiled and filtered while hot, the resulting fluid being of a clear deep red color and faintly acid reaction. This, if kept in a cool place, will remain unchanged for a considerable time. Probably a crystal of thymol or of chloral hydrate would prolong the period. At the time of using, it is diluted with two or three volumes of distilled water, as it is quite thick when cold.

This solution stains red all objects hardened in chromic acid or chromium solutions. A beautiful violet stain, which is also more permanent than the red, may be produced as follows: The section is stained for one or two minutes as usual in the red fluid, then washed in distilled water, and transferred to a one per cent aqueous solution of lead acetate. Here it is washed until the red has turned to a lilac, when the specimen may be at once mounted in glycerine, or transferred through alcohol or clove oil to balsam.

Moving a Ninety Foot Chimney.

One of the most difficult transfers of heavy structures yet attempted was successfully completed in Salem, Mass., a few weeks ago, where a brick factory chimney, 90 feet high and only 6½ feet in diameter at the base, was taken up and moved, with the aid of six men and two horses, 100 feet, and safely deposited upon a new foundation. The chimney was nearly cylindrical, the upper diameter being 5 feet; and it was estimated that a sway of 3 inches from the vertical would bring it to the ground, so that great precautions were taken to prevent lateral movement in transferring it to the platform on which it was to be transported. A cage was first built around the chimney, consisting of horizontal timbers supporting shores, which extended 23 feet up the sides of the shaft, and were re-enforced by a second set of shorter ones beneath. After these were in place, and well secured, holes were cut through the brickwork and needles inserted, under which thirty-four jack-screws were placed, and the shoring and shaft raised together high enough to allow a rough platform to be constructed under them, and rollers to be set in place. The platform, which was of strong plank, extended to the new position of the chimney, and by leveling it carefully, and employing a large number of rollers, the load, weighing 130 tons, was easily moved into place.

IMPROVED FUNNEL.

The funnel herewith shown is provided with a float for automatically closing a valve as the liquid rises, so that there is no danger of overflowing the vessel. A valve, A, arranged to close the funnel, is pivoted in small uprights of an annular flange secured in the funnel. The valve is formed with a tail piece, and the funnel is provided with a bent rod which may be pressed upon the tail piece to open the valve; the rod is raised by a coiled spring. For holding the valve open a setting and tripping device is employed, consisting of a pivoted ring, B, on one side of which is a notched tongue, and a metal tongue secured to the under surface of the valve. The ring is so pivoted that the side opposite the tongue overbalances the side to which the tongue is secured, and causes it normally to be elevated when the funnel is right side up. The side of the ring opposite the tongue is provided with a plate against which the float rod, C, strikes to trip the valve. The float is inclosed in a tube attached to the funnel. Around the tube of the funnel is a short but large tube having a series of holes formed in it; within this is placed an adjustable tube having a flange at its lower end to support the funnel upon the vessel to be filled. The tube of the funnel can thus be raised more or less out of the vessel, according to the height at which it is desired to have the liquid rise in the vessel before the float will trip the valve.

By pressing downward upon the rod the valve will be raised until its tongue enters the notch of the tongue of the ring, which will hold the valve open so that it will not interfere with the flow of liquid. As the liquid rises it will lift the float, causing the ring to turn on its pivots and lower the notched tongue, to release the metal tongue and permit the valve to drop and close the funnel. By this means there is no danger of over-

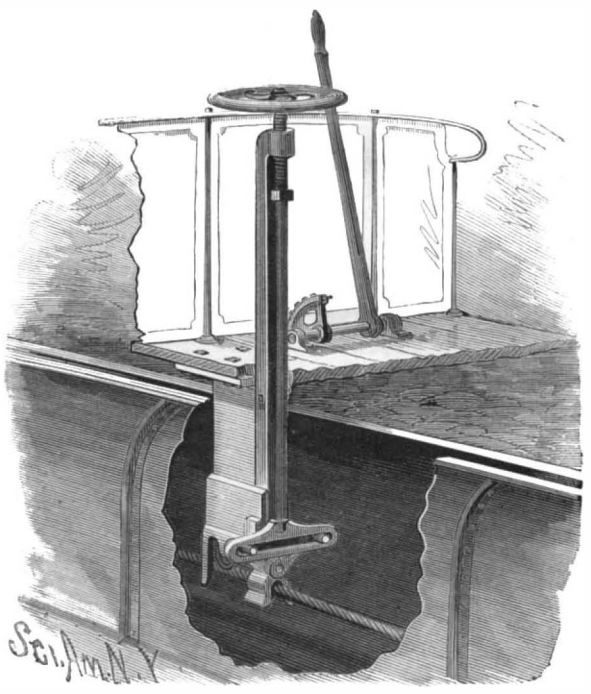
STADLER'S IMPROVED FUNNEL.

flowing the vessel, which may be filled to any desired height. This invention has been patented by Mr. Peter C. Stadler, of 439 W. 46th St., New York city.

IMPROVED CABLE GRIP.

The engraving shows a device for gripping the cable of cable roads, patented by Mr. David B. Anders, of 2116 Master Street, Philadelphia, Pa A flat bar, projecting downward from the car floor through the slot in the tunnel in which the cable runs, is connected by a chain with a groove-edged quadrant on a shaft journaled on the car floor and having an upwardly projecting lever. The upper end of an arm extending upward from the flat bar is provided with a nut through which passes a screw having a hand wheel on its upper end, and having its lower end swiveled on the upper end of a rod passing downward in front of the bar. On the lower end of the bar is a cross piece having a slot, into which pass two pins projecting from the upper end parts of two gripping levers pivoted on the bottom edge of the flat bar. Below the pivot these levers have gripping jaws from which lugs extend downward and away from each other. Guide lugs also extend downward and outward from the lower end of the bar, in which a roller is journaled to prevent the lower edge of the bar from sliding off the cable, thus greatly reducing the friction.

To grip the cable the screw is turned to raise the rod,



ANDERS' IMPROVED CABLE GRIP.

whereby the jaws are pressed firmly against the cable; to release the cable the rod is moved downward. The lugs on the levers guide the cable in between the jaws. When the car arrives at a cable crossing, the cable is released and the lever swung down, thereby raising the flat bar by means of the chain; the lugs on the bar guide the cable to place. This grip operates quickly, and holds the cable firmly.

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THE LIQUEFACTION OF OXYGEN.

Upon boiling in the open air, liquid ethylene produces so low a temperature that compressed oxygen reduced to that degree of cold exhibits, when its pressure is diminished, a tumultuous ebullition that lasts for an appreciable length of time. Upon hastening the evaporation of the ethylene by means of an air pump, as was done by Faraday for protoxide of nitrogen and carbonic acid, its temperature is lowered sufficiently to bring oxygen to a liquid state.

I have endeavored to overcome the inconveniences and complications that result from the necessity of operating in a vacuum, and, with this object in view, have already suggested the use of liquid formene, which permits of effecting the liquefaction of oxygen and nitrogen in a trice.

I have, nevertheless, thought that, despite such advantages, ethylene, which is now so easy to prepare and manipulate, should be preferred to formene, and I have succeeded in obtaining, by means of ethylene boiling in open vessels, a sufficient reduction of the temperature to effect the complete liquefaction of oxygen.

The process that I employ is exceedingly simple, since it consists in hastening the evaporation of the ethylene by passing through it a current of air or hydrogen reduced to a very low temperature.

In the apparatus that I have constructed the steel receiver, R, which contains liquefied ethylene, is fixed upon a vertical support with its orifice downward. To this latter is adapted a copper worm, of 3 or 4 millimeters diameter, closed by a screw cock and placed in a glass vessel, S.

Upon chloride of methyl being poured into this vessel, the temperature falls to —23°, but if air that has been carefully dried by passing it through a bottle containing chloride of calcium be forced into it, we shall soon obtain a temperature of nearly —70°.

The ethylene thus cooled condenses and fills the worm. When the cock at the lower part of the vessel, S, is opened, the ethylene flows under a slight pressure, and without perceptible loss, into a test glass, V, arranged (as shown in the figure) in a vessel that contains pumice stone saturated with sulphuric acid designed to absorb the aqueous vapor. It is, in fact, indispensable to act in absolutely dry air, for, without such precaution, the humidity of the atmosphere would condense in the form of a layer of ice upon the sides of the test glass, and make them absolutely opaque.

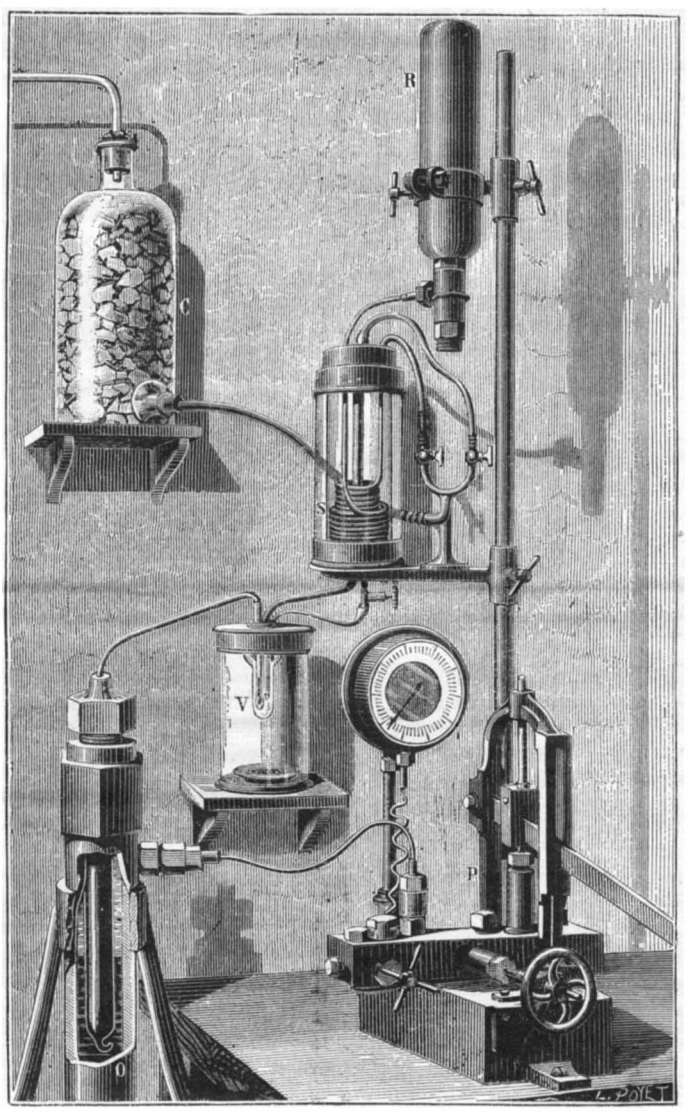
It suffices, then, to hasten the evaporation of the ethylene by means of a rapid current of air or hydrogen cooled in a second worm placed in the vessel, S, of chloride of methyl, in order to allow the compressed oxygen in the glass tube fixed to the upper part of the reservoir, O, to resolve itself into a colorless, transparent liquid, separated from the gas that surmounts it by a well defined meniscus. Upon the pump, P, being worked, the injected water acts upon the mercury in the receiver, O, and forces it to enter the test glass that contains the oxygen. The gas thus compressed becomes liquefied, as we have said, in the branch of the tube contained in the glass, V. This tube dips into the ethylene at a temperature of —125°. The mass of liquefied oxygen, which is as limpid as ether, is figured in black in the engraving, in order to render it visible.

By means of a hydrogen thermometer that I shall make known the construction of ere long, I have measured the temperature of the ethylene, and, in one of my experiments, found it to be —123°. I hope that, by cooling the current of hydrogen with more care, the temperature may be still further reduced.

The copper spirals in which the air and ethylene circulate dip into chloride of methyl, which is rapidly evaporated by means of a previously cooled current of air.

In short, I have found that, by hastening the evaporation of liquid ethylene, by means of a very cold current of air or hydrogen, its temperature is reduced much below the critical point of oxygen, which, in this medium, liquefies in the clearest manner.

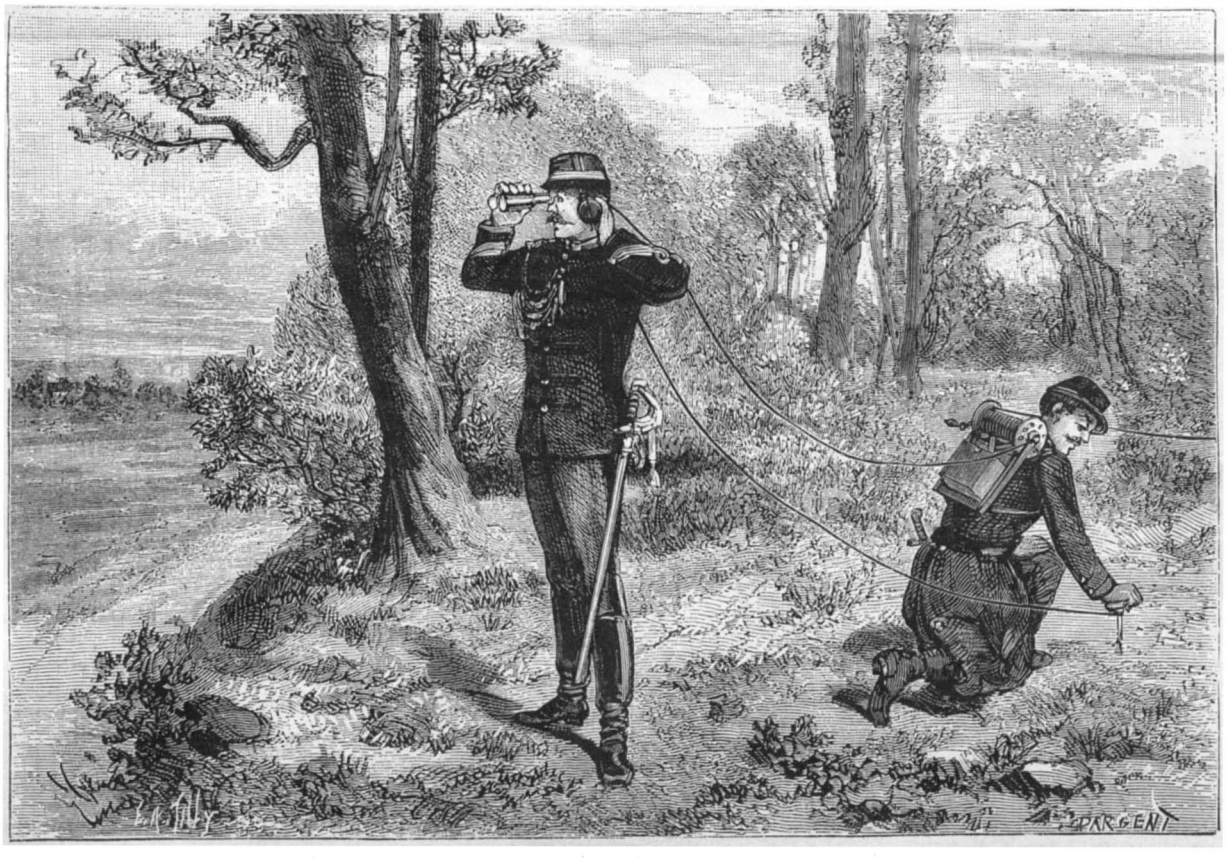
This experiment is so simple and easy of performance that it may henceforth be performed in laboratories, and be repeated in public lectures.—*L. Cailletet, in La Nature.*



CAILLETET'S APPARATUS FOR LIQUEFYING OXYGEN.

TELEPHONE APPARATUS FOR MILITARY PURPOSES.

The illustration herewith presented, from *La Lumiere Electrique*, gives a good idea of one of the many uses to which electricity is being put as an aid to modern military operations. The officer standing forward with field glasses to his eyes surveying the country is supposed to be an advanced scout watching the movements of the enemy, while at his ear is a telephone receiver, connected by wire with some point in his own army, probably with the chief of staff or general in command, whence the scout can receive continued directions. This receiver is also a transmitter, through which the scout can, in like manner, telephone back the result of his observations, thus communicating instantly to headquarters information of the designs of the enemy, and giving opportunity for the necessary counter movement of forces. It will be readily seen from the picture how the wire is laid loosely along the surface of the ground, from the reel on the soldier's back; no battery being required, the whole takes up no more space than an ordinary knapsack. The wire is insulated, and is very light, and can be reeled up on return, if desired.



THE MILITARY TELEPHONE.

Decay of an Iron Bridge.

A phenomenon has been observed in the Callowhill Street Bridge, in Philadelphia, which is of great interest to architects and engineers, although the taxpayers of Philadelphia probably take no satisfaction in it. A few days ago men were sent to repaint the girders of the bridge, and began, as a preliminary process, to scrape off the rust. The attention of the foreman was soon attracted by the unusual size and weight of the scales of rust which fell upon the railroad below, and, on picking some of them up, found that they were solid masses, from one-quarter to three-eighths of an inch in thickness. It is needless to say that plate iron girders which had lost their substance by rust to such an extent as this would have little strength remaining, and the vibration of the bridge under the movement of a horse-car or loaded cart, which was so great as to compel the painters sitting on their swinging stage to cling to the ropes or the braces of the bridge to avoid being shaken off, indicated still further the necessity for an immediate inspection of the whole structure.

The first examination was an informal one, made by persons living in the neighborhood, who found not only that some of the iron work had been nearly eaten through by rust, but that the whole bridge, which is built on a steep rising grade, had moved down hill so far as to tear out the top courses of stone of the upper abutments, and to buckle the struts of the intermediate supports; while the movements of the roadway framework had cracked the asphalt over them, and forced out the paving blocks between the horse railway tracks. The bridge includes one span of 340 feet, and as there can be no trifling with girders of this length, extensive repairs will probably be necessary. The structure was only completed in 1875, so that ten years of neglect have sufficed to bring it nearly to destruction, and those who have to design important iron roofs or bridges will do well to notice by this example how short is the life of such works if not properly cared for. In the case of the Callowhill Street Bridge, says the *American Architect*, the corrosion was probably hastened by the action of the smoke from the locomotives which passed under it; but there are hundreds of bridges exposed to the same action, and the iron roofs of railway stations and manufactories are often subjected to similar or more dangerous influences.

A Locomotive Struck by Lightning.

A singular accident recently happened at Milnes, Va., on the Shenandoah Valley road, when the locomotive of a freight train, which was standing on a siding, was struck by lightning. Both the engineer and fireman received severe shocks, the engineer being so injured that he did not recover for several days, and the engine was somewhat damaged. Accidents of this kind rarely happen.

Last autumn a bookseller named Meyer, of Ronneburg, tied a waterproof label under the wing of a swallow which had occupied a nest at his house, and had become comparatively familiar. On it he wrote a query in German, to the effect that he wished to know where the swallow would pass the winter. The bird returned to its former nest, bearing an exchange label similarly fastened, saying, in German also, "In Florence, at Castellari's house, and I bear many salutations."

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LOOSE PULLEY LUBRICATOR.

The accompanying engravings—Fig. 1 is a perspective view and Fig. 2 a longitudinal sectional elevation—show a loose pulley oiler, in which the flow of the oil is automatically controlled by the speed of the pulley, and which is remarkably simple in construction and reliable in operation.

By unscrewing the lid or cover, C, the reservoir, B, can be filled with oil. Within the reservoir is a piston, E, which is normally kept at the inner end of the cylinder by the tension of the spiral spring, D. During the revolution of the pulley the piston, thrown out by centrifugal force, exerts a pressure upon the oil corresponding to the velocity of the pulley, and forces it through the feed pipe, F, to the nozzle on the

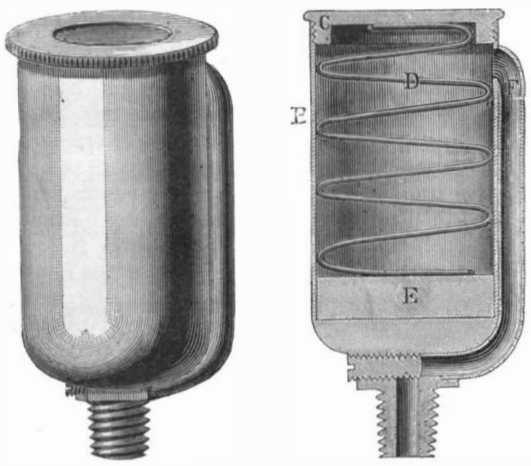


Fig. 1. Fig. 2.

LOOSE PULLEY LUBRICATOR.

shaft. The supply is regulated by means of a screw, which may be set so that the reservoir will be emptied in a few minutes, or so that the amount will last for weeks; when the proper aperture for the screw has been ascertained by experiment, the oiling of the pulley requires no further attention. When the pulley stops, the flow of oil also stops; and the spring, carrying the piston back, draws all the oil out of the feed pipe into the reservoir, thereby preventing the wasting or spilling of oil—a fact which, it will be readily understood, brings, besides the advantage of economy, that of absence of soiling of fabrics, of soaking of belts with oil, and other inconveniences incident to the old methods of lubrication.

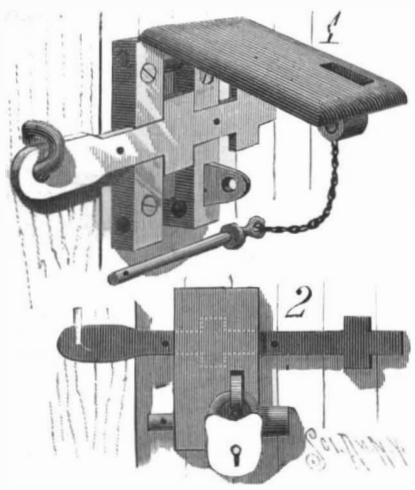
These lubricators, made by the Loose Pulley Lubricator Manufacturing Company, of Middletown, Conn., are adapted to pulleys from six inches in diameter and upward, and are screwed into the pulley hub by tapping out the oil hole, an operation easily performed without removing it from the shaft.

Endurance of Woods.

In some tests made with small squares of various woods buried one inch in the ground, the following results, says *The Garden*, were noted: Birch and aspen decayed in three years; willow and horse chestnut, in four years; maple and red beech, in five years; elm, ash, hornbeam, and Lombardy poplar, in seven years; oak, Scotch fir, Weymouth pine, and silver fir decayed to a depth of half an inch in seven years; larch, juniper, and arbor-vitæ were uninjured at the expiration of the seven years.

FASTENING FOR FREIGHT CAR DOORS.

The base or stationary part of the fastening, shown open in Fig. 1 and locked in Fig. 2, has corner holes to receive bolts by which it may be attached to the car body. One of the bolts is made with an eye head to pass through a slot in the cover and receive a padlock, when desired. The cover is made with an eye upon the inside of one end to enter a recess in the base, and receive a pin by which the two parts are hinged together. Upon the inside of the other end of the cover is an eye to enter a recess in the end of the base, and receive a pin passed through a transverse hole in the base. The pin is made with a head on one end and a hole through the other end to receive the wire of the seal, which is also passed through a hole in the hasp, which is hinged to the door by a staple and formed with two cross heads as shown in the engraving. In the base of the fastening is a transverse groove for the body of the hasp and a longitudinal groove for a cross head. The hasp is secured in place in the grooves by the cover. With this construction the door can be fastened fully or partly closed, and when fastened and sealed cannot be opened without breaking the seal.



This invention has been patented by Mr. G. A. Germond, whose address is Station R, New York city.

Good Inventors.—Poor Lawyers.

One of our English exchanges says of English inventors that they are usually clever and necessarily of ingenious turn of mind, but concludes that they as a class should make poor lawyers. The writer cites a case which has heretofore appeared to be interminable, and had assumed something of the proportions of a *cause celebre* in the annals of patent litigation. It was the old story of alleged infringement of a patent right, and the appeal against the decision of the inferior courts was dismissed in the superior court in favor of the respondent, not because there was or was not infringement of the patent right, but because the appellant had in his specification insufficiently described the character and defined the limits of his invention. There was apparently some ground for the belief that the appellant had room for complaint against the respondent, inasmuch as the Bench remarked that it was a matter for regret to have to come to the decision which, as a matter of law, had to be come to, as the invention in question was a valuable and clever one.

Here, then, valuable patent rights have been practically a loss to the original inventor because of his having failed to observe sufficient care in the wording and preparation of his specification. It is impossible to say how many valuable inventions have been lost to their inventors from a similar cause. It is not sufficient, in order to secure the fruits of a valuable invention, to merely patent it. The degree of protection afforded by a patent depends, to a great extent, upon the proper wording of the specification, which should carefully define the nature and scope, if not the limits, of the invention. It should omit nothing that it is of present or prospective utility to state. The less ambiguous it is, the fewer are the chances and possibilities of infringement and ultimate pecuniary loss.

Steel against Iron.

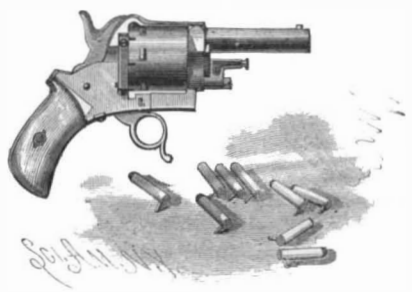
Mr. William F. Zimmermann, of the Pittsburg Testing Laboratory, has completed for the Detroit Dry Dock Company a test of the new steel plates which will enter into the construction of the new steamer they are building for the Detroit and Cleveland Steam Navigation Company. The average tensile strength of the plates is stated to be 60,000 pounds to the square inch. This soft steel is said to be of such remarkable elasticity that a piece of plate may be stretched one-half longer than its usual size without parting. The Detroit Dry Dock Company recently made some experiments of its own with the soft steel used in the construction of the new steamer Mascotte at its yards in Wyandotte. They were made both with soft steel and the best quality of iron used in the construction of iron ships. Strips of cold steel plate $\frac{5}{16}$ inch thick and $\frac{3}{4}$ inch wide were twisted like an auger in a lathe, and even doubled, without cracking or causing a single abrasion of the metal's surface. Angle irons were flattened cold and bent in like manner. Another strip was bent repeatedly without causing it to break or even flaw. In the presence of the owners of the Mascotte, a large ball weighing 950 pounds was suspended at a height of 35 feet, and allowed to drop on a $\frac{5}{16}$ inch plate, bulging it about 20 inches into the ground without breaking it. The ball was then dropped on the reverse side of the plate, and this repeated five times without breaking the plate. The same test was made with a ½ inch iron plate, and it was broken the first time. These tests are regarded as furnishing a conclusive demonstration of the comparative merits of soft steel and iron for resisting sudden shocks, and consequently of their respective merits as materials for the construction of modern ships.

Decomposition of Cast Iron by Heat.

From some experiments which M. L. Forquignon made upon malleable iron, he was led to suppose that cast iron, at a temperature somewhat inferior to its melting point, is decomposed into free graphite and a purer carburet of iron. He accordingly heated cast iron in a vacuum to a temperature of from 900° to 1,000° C., for several days, without melting or softening. The metal became malleable, and its surface was covered with a dull grayish efflorescence, which produced a mark upon paper or on rough porcelain. The fracture was sometimes of a uniform black, like that of a lead pencil, and sometimes it was dotted with black grains of amorphous graphite, regularly disseminated throughout the mass. It seems probable, according to the *Comptes Rendus*, that this partial decomposition depends upon a tendency to equilibrium between the carbon, the iron, and the carburet of iron, the relative proportion of each of these bodies being a function of the temperature. The decomposition of a homogeneous solid into two other solid bodies is a very rare, if not unique, phenomenon.

THE SMALLEST FIRING REVOLVER.

The very diminutive firearm illustrated in our engraving is the workmanship of Mr. Victor Bovy. It is shown in actual size; and of working revolvers, it is undoubtedly the smallest in the world. The dimensions are truly Liliputian; the total length, from handle to muzzle, is 1½ inches, and the weight is something under half an ounce. The cartridges shown are also natural size, though only about a quarter of an inch in length, and the weight of shell, charge, and bullet is only a trifle over a grain. The charge consists entirely of fulminate, as the dimensions are too small to permit the use of powder. It is in all respects a perfect little instrument, and quite as complete as larger revolvers. There are six cartridge chambers, a self-cocking device, and a minute rod for discharging the empty shells. In spite of its pygmy proportions, its execution is quite comparable with larger arms. At a distance of ten inches it gave a penetration in wood of three-sixteenths of an inch, while at four and a half feet the bullet passed through a pane of ordinary glass. The



THE SMALLEST FIRING REVOLVER.

accuracy of aim is naturally limited by the short barrel and nearness of the sights to each other, though at four and a half feet the bullet passed within two and three-eighths of an inch of the bull's eye. The revolver has the appearance of a toy, but it is nevertheless a veritable weapon, and if directed toward a vital part would be quite capable of producing a serious wound.

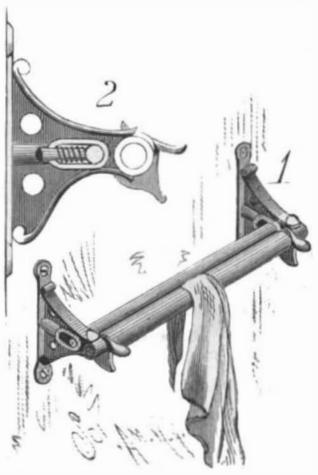
Fast Railway Time.

A train carrying the president and directors of the Delaware, Lackawanna & Western Co. recently made the trip over the Morris & Essex Division, from Hoboken to Washington, N. J., 67 miles, in 1 hour 24 minutes, being at the rate of 47·9 miles per hour for the entire distance, including two stops for drawbridges and slow running required at other points. The fastest time made was on the 4·6 miles between Port Morris and Waterloo, which was run in 4 minutes, or at the rate of 69 miles per hour. The 20 miles from Port Morris to Washington was run in 19 minutes, or at the rate of 63·2 miles per hour. The train consisted of 3 cars, and was drawn by engine No. 134, which has 18 x 24 in. cylinders and 5 ft. 6 in. driving wheels.

The fast train on the West Shore road on June 4 last made the run from Newark, N. Y., to East Buffalo (94 miles) in 119 minutes. Of this time 13 minutes is deducted for stops, leaving the actual running time 106 minutes, being at the rate of 53·2 miles per hour. The actual running time from Frankfort to East Buffalo (202 miles) with 6 cars was 254 minutes. On June 17 the same train with 7 cars ran from Newark to East Buffalo in 105 minutes, and from Frankfort to East Buffalo in 247 minutes, or at the rate of 49·1 miles per hour.

TOWEL RACK.

The simple and convenient towel rack shown in the engraving has been patented by Mr. Joseph Bergsten, of Rockford, Ill. Each bracket has a bearing in which the reduced ends of the outer towel holding roller are journaled; on each end of the roller is a cam plate having a finger piece by which it may be turned. The ends of the clamping roller are supported in slots and are pressed outward by springs as shown in Fig. 2. The rear roller being forced back by turning one or both of the cams, the towel may be placed between the rollers,



where it will be firmly held, after the cams have been moved back, by the springs forcing the rear roller outward. Should it be desired to hang a towel in the rack, one or more towels being already in, a cam at one end only need be turned to separate the rollers, to allow the extra towel to be placed between them. To remove the towel it only necessary to pull them from between the rollers, which turn as the towels are drawn out.

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Electricity and the Statue of Liberty.

Some of our daily contemporaries appear to be getting alarmed lest the statue of Liberty be slowly but surely destroyed through the electrical action developed by the contact of the internal bracing of iron with the shell of copper. There is, however, no ground for such fears. Mr. Bartholdi, it is hardly necessary to say, foresaw the possible danger from this source, as well as that due to expansion, and took the proper precautionary measures to obviate both. It is proposed (according to *Le Genie Civil*), when the parts of the statue are assembled, to insulate the two metals by interposing small plates of copper covered with rags smeared with red lead—a method successfully employed in the sheathing of sea going vessels.

Notwithstanding the letters communicated by certain electricians to some of the daily journals, it would seem that too great importance is being attached to this matter. No precaution whatever against galvanic action was taken in the case of the 75 foot statue of St. Charles Borromeo (on Lake Maggiore), which, although constructed of copper only one and a half millimeters (0·06 inch) thick, and internally braced with iron that is in direct contact with the shell, has held its own for nearly two centuries without any perceptible change. Again, in the theater of Monte Carlo, which is situated very near the sea, and which was constructed over four years ago, the cupola is of copper in direct contact with the iron framework that supports it; yet no injury to it, due to galvanic action, has as yet been observed.

Ethnology.

The Director of the Bureau of Ethnology at Washington, Major Powell, has mapped out the work in his department for the coming fiscal year. The interesting government researches into the life history and arts of the early Americans, which were inaugurated several years ago, are to be continued and extended. The work of this department has already attracted much attention on all sides, and the additions of the coming year promise to be of much value.

Dr. Cyrus Thomas, who is in charge of the division of mound exploration, will resume the work begun about three years ago, and will be aided by two or three assistants. He will first visit Wisconsin, in order to examine the effigy mounds in that locality, and later in the season will go to Tennessee and Mississippi, where investigations are already in progress. Since being in the field, Dr. Thomas has secured about 15,000 specimens of the handiwork of the mound builders. Many of the mounds are undoubtedly very ancient, but others are of comparatively modern origin, and bear date subsequent to the advent of the Europeans. One mound in Tennessee disclosed a string of sleigh bells buried among the flint and bone implements in such a position that it undoubtedly formed part of the original deposit. In another in Georgia, two copper plates were found bearing figures resembling those discovered in Central American ruins. The workmanship on these plates is much superior to that on any of the accompanying articles, and leads to the suspicion that they came from the South. They are the only indications which might point to any connection between the mound builders and the Aztecs or Pueblos, while, on the other hand, there is much to make us believe that the origin of these curious mounds is directly traceable to the ancestors of the Cherokee and other races of the Mississippi valley. A Spanish coat-of-arms in silver and other articles of European manufacture have been found in a Mississippi mound at a point which De Soto is supposed to have visited. As the earlier Spaniards were regarded by these simple people as celestial visitors, it is quite possible that the mounds containing European articles were built in commemoration of the supposed divine visitation. The purpose of many of the mounds is still a matter of conjecture, while others were undoubtedly intended as places of burial, or were even the foundations of Indian villages, which were thus secured from inundations.

Mr. Victor Mendeleff, the artist and architect, whose models of the Pueblo and cliff villages form so interesting an exhibit at the National Museum, has already started upon his work in New Mexico, Utah, and Arizona. Last year he visited the Chaco Cañon in New Mexico, and made surveys of several pueblos of high antiquity. The ruins of this locality are of masonry, and are far superior to the adobe pueblos of the present day. In places they are still 40 feet high, and show the floor lines of three or four stories. The largest of these ancient apartment houses covers more ground than the capitol at Washington. Mr. Mendeleff, who has been engaged in the study of Pueblo architecture for several years, will first visit the Moki towns, seven in number, three of which are found on a narrow mesa, whose precipitous sides are nearly seven hundred feet high. Later he will go the Cañon de Chelley, in Arizona, where a narrow gash in the earth, a thousand feet deep and fifty miles in length, contains a number of cliff villages of considerable extent, many of which are perched high upon the rocks, six hundred feet above the bottom of the ravine. He will also make survey of the "seven ruined cities of Cibola," in the neighborhood of Zuñi, so celebrated in Spanish fable and romance.

The study of the sign language and picture writing will also be continued. Having found the key to the expressive gestures of the aborigines, it has been found that the rock etchings and paintings existing in all parts of the country, which were before so meaningless, are now easily translatable to any one familiar with the sign language. The pictography of these ancient American races is found to be almost identical with that of the Chang dynasty, which flourished in China 1500 B.C. Investigations will also be continued into the verbal language of the different tribes, with a view to their better classification.

Philology, which has revealed so much of the ancestry of the European nations, promises to be no less useful in determining the relationships of the North American tribes. The two most powerful tribes of the Southwest, for instance the Apaches and the Navajos, have in this manner been traced to a common origin in British America, where the parent stock, speaking the same language, are still found.

These investigations have established the fact that the advancement of the North American tribes, as illustrated by their art during the past two or three centuries, is exactly equivalent to that existing in Europe and the East during the stone age.

ELECTRIC FAN.

A very refreshing invention, especially for the hot weather season, is the electric fan shown in our engraving. It consists of an ornamental standard, about a foot high, on which is mounted a screw propeller fan. On connecting the wires of a battery with the standard the fan revolves rapidly, and delivers a cool breeze in any direction desired. The upper part of the standard, on which the fan is carried, is hinged, which allows of the adjustment of the fan to any desired oblique position. The battery is contained in a little box, 4½ inches square and same depth, holding liquid enough to run the fan for several hours, when it is poured out and replaced by a fresh supply.

Pat. applied for, S. M. & Co.

We have had one of these little fans running on our desk for several days past, and it gives much satisfaction. They are made by Stout, Meadowcraft & Co., 21 Ann Street, New York, whose excellent and reliable work in the line of small electrical lights and other instruments is well known.

The Treatment of Corpulence on Physiological Principles.

As analyzed by the *Birmingham Medical Review*, November, 1884, Ebstein, in his work on corpulence, gives some valuable practical points for the reduction of obesity. According to him, fattening is strictly analogous to the fattening of cattle, and depends on overfeeding. He, however, disputes the current view that fat makes fat; on the contrary, he thinks fatty food protects the albumen, and prevents its forming fat. His plan of treatment, therefore, consists in moderating the quantity of food, and while cutting off all vegetable carbo-hydrates, sugar, starch, etc., allowing a moderate quantity of fat, two or three ounces daily, to be taken. He also suggests that the diet should be monotonous, greasy, and succulent, so as to cause satiety rapidly. He disallows beer, but permits light wines.

The plan advocated appears rational, and is free from the objection to Banting's method, which is too much like starvation. The following is the diet used successfully by Ebstein in one of his cases:

Breakfast.—One large cup of black tea—about half a pint—without sugar; two ounces of white bread or brown bread, toasted, with plenty of butter.

Dinner.—Soup, often with marrow; from four to six and one-half ounces of roast or boiled meat, vegetables in moderation, leguminous preferably, and cabbages. Turnips were almost and potatoes altogether excluded. After dinner, a little fresh fruit. For second course a salad or stewed fruit without sugar. Two or three glasses of light wine, and immediately after dinner a large cup of black tea, without milk or sugar.

Supper.—A large cup of black tea, as before. An egg, a little fat roast meat, or both, or some ham with its fat, Bologna sausage, smoked or fried fish, about one ounce of white bread, well buttered, occasionally a small quantity of cheese, and some fresh fruit.

On this diet the patient lost 20 pounds in six months.

Ebstein insists on the necessity of always keeping to the restricted diet if the tendency to corpulence is to be successfully combated.—*Therapeutic Gazette.*

Origin of Gulf Stream Life.

In speaking some time ago of the almost incredible profusion of animal life in the surface waters of the Gulf Stream, the suggestion was made that a biological question of no small interest and importance was forced upon us by the facts there presented. The question is this—Where shall we look to find an origin for the bioplasm there displayed? From the lowest to the highest, from the infusoria to the fishes and the cetaceans, they are preying upon one another. We see how the blackfish and the dolphins live. They are but appropriating the flesh of fishes, squids, etc., already existing as perfectly formed animal food, and digesting it for their own nutriment. This is plain, and in accordance with common experience, but as we go on down in the scale we must presently be brought to a pause.

Animal bioplasm, according to all the recognized laws of modern physiology, cannot be produced from inorganic materials. No one principle has seemed to be more thoroughly established than this—that it is the peculiar function of the vegetable kingdom to absorb the proper inorganic materials, say carbon, oxygen, nitrogen, and hydrogen, and transform them by its wonderful and life-giving power into organic substances, into bioplasm first and then into the various tissues required. It has been held that the food, properly speaking, of all forms of animal life must have had these inorganic materials transformed into organic substances before ingestion, otherwise there was no possibility of its assimilation; that carbon, oxygen, and hydrogen were all of them foreign bodies to us, and when introduced into our systems, perhaps mechanically with our food, must remain of no service to us, and could never be by our powers of digestion transformed into a hydrocarbon, like sugar for instance, or starch, or fat.

This has been, and is, the accepted theory and belief, and yet if we adopt it and follow it out to its legitimate conclusions, we shall find the facts which were previously stated as to the teeming life of the Gulf Stream exceedingly difficult of explanation. The vast proportion of that life must originate in the region where it lives and dies. Some favored wanderers come in from outside, for the cetaceans, the sharks, the albicore, barracuda, dolphin, etc., travel fast and far, but they are of small importance in the aggregate. There must be of necessity a very large amount of new bioplasm in constant and daily origination from inorganic materials. The question is, Whence does it come?

It is the unanimous testimony of the observers on the staff of the Fish Commission, from whom the facts as to the abundance of the surface life are derived, that the water of the Gulf Stream is remarkably clear and transparent, that the manifestations of vegetable life in it are very small indeed. There are masses of Gulf weed floating here and there, but not in any great quantity, nor is there reason to believe that the Gulf weed is used for food, except very slightly, by the animals around it. Many of the hydroid polyps are attached to it, and drift with it, but they use it only as a moving house, a boat, or raft, so to speak, while they industriously collect their food from the water around them. Some of the small fishes, specially the curious, grotesque looking *Chironectes*, make the same use of the Gulf weed tangles as do the polyps, but they never touch it as food. It is quite sure that the Sargassum furnishes small amount of material for new bioplasm. Nor does there seem evidence that any of the algæ are sufficiently abundant to afford any relief from the perplexity. Even the minute, microscopic diatomaceæ which swarm so infinitely in many parts of our shallow waters are apparently in small numbers in the Gulf Stream, and we have, therefore, no profusion of vegetable life which in the slightest degree corresponds to that of animal life.

The only explanation that seems available is this—that some, or perhaps all, of the lower forms of animal life have really the power which has hitherto been reckoned the peculiar prerogative of vegetable organisms, that of transforming inorganic matter into organic. If we assume this, the mystery of the origin of the swarming myriads is at once removed. Nor is the assumption one that need startle us, for we well understand that along the border line, on either hand, the functions which are shown in the higher grades to be clearly animal or vegetable are so slightly specialized or differentiated as to have much less significance than in the more complicated types.

Disinfectants.

Two pounds of copperas, or sulphate of iron, dissolved in a pail of water, will greatly assist in purifying a privy or cesspool. A pound of nitrate of lead dissolved in the same way is excellent for sinks, drains, or vaults. Chloride of lime is also effectual, or a layer of charcoal dust will prevent offensive odors arising from any decomposing substance. The quantity of these substances will depend upon the amount of filth to be deodorized, and the length of time during which they will be effectual will depend upon local conditions.

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Some Common Mistakes about Canned Goods.

A United States Army surgeon writes us from Indian Territory, asking as to the reason for two punctures sometimes seen in the caps of cans containing fruits and other goods, and whether this indicates that the goods have been "reprocessed." The facts touching this point, as communicated to us by one who is an expert in the business, are as follows:

The presence of two or more punctures or solder holes in a tin of canned goods is not evidence of reprocessing. In capping the can after filling with fish, fowl, meat, vegetables, fruit, or whatever it may be, a cap is used which has a small hole in the center. A soldering iron, made of copper, heated to a red heat, is used, the heat from which produces expansion of the air within the can, and so that the air escapes through the hole or vent in the center of the cap. If it could not do so, it would be a difficult operation to cap the can successfully.

After the can is capped the vent is closed with a drop of solder, and thus one vent, or puncture, is shown on the top of the can. The can is then placed in a bath or process kettle, after which the operation varies. If the goods are what is known as "double bathed goods," they are taken from the kettle after a certain time, which varies according to the article packed or the formula of the processor, and then vented or exhausted. The ends of the can being bulged out from the pressure exerted by the expansion of the contents under heat, the first vent hole in the top is either unsoldered with a hot soldering iron, or a puncture is made with an awl or sharp instrument, within half an inch from the first vent. The air and steam having been allowed to escape, the tops resume their natural condition, or are pressed in, when the second vent is closed with another drop of solder, and the goods are returned to the process kettle and bathed, according to the kind of goods being packed.

If a hot soldering iron is used to open the first vent hole referred to, after the can comes from the bath, as is sometimes done, only one vent hole will be observed on the top of the can.

If another puncture is made in the cap, and that closed with a drop of solder, it will show two punctures or vent holes in the top of the can; and as some manufacturers double process their goods, some cans will show three solder spots, but this is not evidence that the goods have been what is known as "swells," which have been reprocessed; for what would be easier for a packer who desired to reprocess goods than to open the original vent hole in the top of the can, provided there was only one there, let out the gas which had generated from fermentation, solder it up again, and give it a few minutes' bathing, which would serve to keep it? This is sometimes done in the case of seed fruits, which generate a gas from their pits or seeds, the germination element of which is not entirely killed by the original processing.

Trying a New Compressed Air Car.

In Astoria, one of the suburbs of New York city, a trial was made a few days since of driving a street car by compressed air, according to the system of Robert Hardie. The car was built by the John Stephenson Company, and fitted up with compressed air chambers to run a small motor or engine on the front platform, the air chambers being under the car and the car seats, and wherever there was spare room. This capacity was said to be sufficient to run the car ten miles, the rate of motion being very efficiently controlled by an air brake.

THE GREAT BLOWERS OF THE DENAIN AND ANZIN FORGES.

The progress of metallurgy is necessitating the construction of more and more powerful accessory apparatus. The Societe des Anciens Etablissements Cail, which has signalized itself in recent times by the construction of the new French artillery and by that of the great Bange gun, has delivered to the Denain and Anzin Forges and Steelworks two colossal machines, which are designed for forcing air into the Bessemer blast furnaces installed at those great works. Our engraving (from a photograph) represents one of the two blowers of the Denian Forges. These apparatus, which are each composed of two vertical engines coupled to the same shaft, have the following dimensions:

ONE OF THE BLOWERS OF THE DENAIN AND ANZIN FORGES.

Diameter of steam cylinder	3 feet.
Diameter of air cylinder	7 "
Common stroke of pistons	5 "
Number of revolutions per minute	22
Effective pressure of steam	11 lb.
Pressure of air in cm. of mercury	20
Diameter of single-acting air pumps	1¾ ft.
Stroke of pistons	2½ "
Volume of air sucked in per minute	15,894 cub. ft.

These machines have been running regularly, day and night, ever since they were set up, which dates, for the first ones, back to January, 1884.

The coupling of the two engines upon the same shaft permits of running at very variable velocities—from 5 to 6 up to 22 revolutions per minute, according to the needs of the moment, while blowing at a given pressure.

The distribution of steam is perfect, and the vacuum is constant at 65. The wind cylinders are well constructed. The force and suction valves are rectangular bands of rubber, resting upon gratings. They offer a wide section to the passage of the blast, and operate almost noiselessly. These magnificent apparatus have met all the requirements that were expected of them, and do honor to the industry of our country.—*La Nature.*

The Strength of Clinker Concrete.

The utilization of clinkers as building material is the subject of a long memoir by M. Louvier, an architect of Lyons. It is stated in the *Journal of Gas Lighting* (London) that the extensive use of clinkers for foundation work was begun in the neighborhood of Lyons by small contractors, who leased from the municipality frontages on new roads where the subsoil was bad. Originally these clinkers accumulated in the vicinity of works, where they formed an eyesore, and were given freely to any one who would remove them; the cost of the material delivered on building sites being not more than 1 s. per cubic yard. The contractors found them so useful, however, that clinkers are now marketable in Lyons, and cost, delivered, as much as 10 s. 6 d. per cubic yard. A small quantity of common, or hydraulic, lime is mixed with the clinkers before use, and the mixture is then wetted and rammed in layers.

When arches or vaults are formed of this kind of clinker concrete, care is taken not to place the layers of material parallel to the surface of the ground or the curve of the centering, but to ram the layers in such a way as to consolidate them vertically to the curve of the intrados. In this way all risk of shaking out any of the material is avoided. Originally used by cheap constructors, this method of construction has been adopted by architects for important works; and M. Louvier has recently depended upon it for the basement of the new *hotel* of the Lyons prefecture. He had previously constructed an experimental vault of the required dimensions, 6·30 meters span, 1·24 meters rise, the concrete being 0·45 meter thick at the crown, and the abutment 0·80 meter wide and 0·90 meter deep.

Three weeks after it was built, this arch was loaded with a weight of 2,500 kilos. per superficial meter; and the load was kept on it for 15 days without causing the slightest settlement or fissure. The load being then removed, a block of stone weighing 600 kilos. was allowed to drop on the crown of the vault from a height of 1 meter, without injuring the structure. Fears having been expressed lest this mixture of clinker and ashes and lime would burn, a portable forge was placed under it, and a fierce fire kept up for half an hour without affecting its substance or strength. It is further stated that at a nitro-benzine factory near Lyons, the walls of which were constructed of this material, a fire occurred of such a destructive character that the machinery was partly melted. The only effect of this intense heat on the clinker concrete was to vitrify its inner surface, but not to destroy the stability of the walls.

Dangerous Business.

N. D. Jones, who transports the nitro-glycerine for the Warren factories, makes a trip down the river in a little boat about every two months. He takes about two tons of explosives, and on his last trip, according to his statement in the Bradford *Era*, he narrowly escaped being run down by the steamer Emma Graham. He stated that the pilots seem to delight in running little boats down, and some day this will be done to the sorrow of some of them, since the amount of glycerine on board would be sufficient to tear a boat up so fine that it would require a search warrant to find the splinters.

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GIGANTIC FLOWERS.

Certain localities seem particularly adapted for the development of both animals and plants, and in the region including India, the islands of the Indian Archipelago, and outlying Australia, certain forms of the latter are found that in the size of their fruit and flowers excite the greatest wonder in those who have beheld them, and not a little credulity in those who have not been so fortunate.

In the southern continent of our own hemisphere is found the great lily *Victoria regia*, that created the sensation of the time when discovered, and a picture recently shown in these columns, representing a boy and girl standing upon one of the leaves, gives a forcible idea of the strength of structure of this giant.

The *Victoria regia*, however, is dwarfed by several flowers that have since been discovered, and, indeed, in South America there are one or two that equal, if not exceed it. The figure in the accompanying illustration conveys something of an idea of the size and dimensions of a gigantic arum, the most wonderful discovery in plant life in recent times. It was found by Beccari in Sumatra, and the plant, which has been named *Amorphophallus titanum*, has an ally in northern countries in the little "wake robin" common in English hedgerows.

The latter is a most attractive little plant, presenting a tuft of rich glossy leaves out of the center of which rises the flower, or more properly aggregation of flowers, for it is a family or group of them, collected about the base of an erect and club-shaped pillar, or column, known as the spadix, that in turn is protected by an envelope or sheath, all growing from an extremely small tuber.

Curiously enough, in the olden times, it was not the flower that was appreciated, but the starch that was obtained from the tuber, being used in the time of Queen Elizabeth for starching the ruffles that characterized the apparel of the court gallants.

The Sumatra arum is a wake robin of mammoth proportions, and it is said that the first European that observed it at first refused to believe that it was a flower. This was before the time of Beccari, who brought the plant before the scientific world. A party was traveliug through Sumatra with native guides, when one of the latter brought into camp a huge object of evidently vegetable structure, at least six feet in length, and endeavored to make the white men believe that it was a flower, or part of one. The story, however, was not credited, and was forgotten until the real discovery was made by the Italian botanist mentioned. He found the plant growing in secluded parts of the country, and considered it to be a most remarkable example of vegetable growth.

Imagine, if you can, a tuber five feet, and sometimes more, in circumference; from this growing leaves on foot stalks ten feet in length, divided and torn by the wind, yet covering an area of forty-five or fifty feet in circumference. Above this towered the gigantic flower, impressing the beholder not only with it size, but by its peculiar coloring. The central column or spadix, that in the wake robin is used as a button hole bouquet, is in this tropical cousin six feet in height and proportionately stout.

The spadix from which this rose was about three feet in diameter, of a bell shape, the edges richly crumpled and toothed in a fantastic manner, and colored a pale greenish tint upon the inside and a rich, black metallic purple without.

A group of these plants would present a remarkable sight, their enormous leaves, the large masses of color, and the huge waving central column resembling more the creatures of some vivid imagination than the reality.

If we consider diameter, the discovery of Sir Stamford Raffles in the same country is indeed a greater marvel. The plant now known as the *Rafflesia arnoldi* is an enormous parasite, uncouth and fleshy, seemingly attaining its huge dimensions by literally absorbing the juices of its neighbors. It is invariably found growing upon the roots of other plants, leafless, rootless itself, represented only by the gigantic flower, from which rises an odor sickening and fetid in the extreme.

The plant first observed was considered an enormous fungus or agaric, but it was soon shown to be a flower. Imagine a rose blasted and swollen, weighing fifteen or twenty pounds, its petals reduced to five in number, the thickness of each being over an inch, each one measuring a foot from the base to the apex, and some idea can be gained of this monstrosity of plants. It measured over three feet across the surface, and the nectary, a vessel capable of holding six quarts, was filled with a reeking fluid that gave out an odor like tainted beef, and was a trap, containing the bodies of myriads of insect victims.

The flower was first discovered on the Manna River, Sumatra, where it is known as the "Devil's Siri Box," and is calculated to create a decided impression on the mind of the observer. Dr. Arnold, after whom it is also named, says of the effect it had upon him when coming suddenly upon it."

"To tell the truth, had I been alone, and had there been no witnesses, I should, I think, have been fearful of mentioning the dimensions of this flower, so much does it exceed every flower that I have ever seen or heard of."

In the island of Java another of these giants has been found, differing but little specifically, and being nearly as large as its Sumatra ally.

In the South American jungles are found many flowers remarkable for their extreme size. On the Magdalena River there grows a climbing aristolochia that attracts the voyager to the shore by the wonderful size and structure of its blossoms, each one of which measures four feet in circumference. The specific name is *Grandiflora*, and it is probably similar to what is known as the "pelican plant" in the West Indies, where the blossom so resembles a pelican's head. The great flowers are often used by the native children as caps, being quite large and stout enough for the purpose. Miers, who observed them in Brazil, says that as they appeared hanging upon the vines, he was reminded of colored handkerchiefs spread out to dry.

GIGANTIC LILY OF SUMATRA.

None but a native would think of approaching near them, much less utilizing them as head gear, as the odor is so fetid as to drive away large animals from their near proximity.

Not only this, but they are poisonous when eaten. Tussac is authority for the statement that an entire herd of swine that had eaten the roots and leaves were destroyed.

A species of this plant, *A. Goldieana*, found on the Old Calabar River and Sierra Leone, is quite as remarkable. The flower is over two feet in length, and eleven inches in diameter at the mouth. It has all the richness of coloring and disagreeable qualities of odor that characterize its ally of the South American continent.

Our familiar night blooming cereus may well be grouped with the phenomenal plants, having a flower that, when fully expanded, measures a foot in diameter. Exceeding this in beauty and size is the *Lilium giganteum*, that constitutes one of the most gorgeous displays in the floral kingdom. This is represented at the museum at Kew by a stem that was over a foot in circumference at the base, and that rose to twice the height of the tallest man, or nearly fourteen feet, and was covered with blossoms, each as large as a large goblet.

The delicate ferns that are the types of grace and beauty in our woods have gigantic representatives in other countries. That known as the "Silver King" (*Cyathea dealbata*) has leaves seven feet in length. This may be considered its normal size, but in the silent forests of New Zealand the delicate fern assumes at once the proportions of a tree, and is met with with leaves forty-two feet in length. Yet these were probably insignificant when compared to their ancestors in the past ages of the world's history.

Origin of the Cereals.

Recent numbers of *Naturen* contain interesting papers, by Prof. Schubeler, on the original habitat of some of the cereals, and the subsequent cultivation in the Scandinavian lands and Iceland of barley and rye more especially. It would appear that barley was cultivated before other cereals in Scandinavia, and that the generic term "corn" was applied among Northmen to this grain only from the oldest times, and that in the Norwegian laws of the seventeenth and eighteenth centuries, wherever reference was made to the "*Kornskat*"—or standard by which land in the Northern lands was, and still is, rated in accordance with the corn it is capable of yielding—the term was understood to apply to barley. Proof of the high latitude to which the cultivation was carried in early ages is afforded by the Egil's Saga, where mention is made of a barn in Helgeland (65° N. lat.) used for the storing of corn, and which was so large that tables could be spread within it for the entertainment of 800 guests. In Iceland barley was cultivated from the time of its colonization, in 870, till the middle of the fourteenth century, or, according to Jon Storrason, as lately as 1400.

From that period down to our own times barley has not been grown in Iceland with any systematic attention, the islanders being dependent on the home country for their supplies of corn. In the last century, however, various attempts were made both by the Danish government and private individuals to obtain home-grown corn in Iceland, and the success with which these endeavors were attended gives additional importance to the systematic undertaking, which has been set on foot by Dr. Schubeler and others, within the last three years, for the introduction into the island of the hardier cereals, vegetables, and fruits. As many as 382 samples of seeds of ornamental and useful plants, most of which were collected from the neighborhood of Christiania, are now being cultivated at Reykjavik under the special direction of the local government doctor, Herr Schierbeck, who succeeded, in 1883, in cutting barley ninety-eight days after the sowing of the seed, which had come from Alten (70° N. lat.). And here it may be observed that this seems the polar limit in Norway for anything like good barley crops. The seed is generally sown at the end of May, and in favorable seasons it may be cut at the end of August; the growth of the stalk being often 2½ inches in twenty-four hours. North of 60° or 61° barley cannot be successfully grown in Norway at more than from 1,800 to 2,000 feet above the sea level. In Sweden the polar limit is about 68° or 66°, but even there, as in Finland, night frosts prove very destructive to the young barley.

In some of the field valleys of Norway, on the other hand, barley may, in favorable seasons, be cut eight or nine weeks after its sowing, and thus two crops may be reaped in one summer. According even to a tradition current in Thelemarken, a farm there owes its name, *Triset*, to the *three* crops reaped in the land in one year!

Rye early came into use as a breadstuff in Scandinavia, and in 1490 the Norwegian Council of State issued an ordinance making it obligatory on every peasant to lay down a certain proportion of his land in rye. In Norway the polar limit of summer rye is about 69°, and that of winter rye about 61°; but in Sweden it has been carried along the coast as far north as 65°. The summer rye crops are generally sown and fit for cutting about the same time as barley, although occasionally, in southern Norway, less than ninety days are required for their full maturity.—*Nature.*

Violin Making.

In a recent issue of the SCIENTIFIC AMERICAN some one asked for names of works on "Violin Making." An esteemed correspondent gives the following authors: Otto on the "Construction of the Violin," etc., Davidson on the "Violin," two very interesting works, the latter being much the more practical.

The first three volumes of *Amateur Work*, published by Ward, Lock & Co., London, England, have the most complete articles, theoretical and practical, ever published. They are written by a pupil of Chanot, one of London's best makers. Some splendid violins have been made from the directions given. To the above may be added "Construction of the Violin," by H. P. Smith. All the above works may be ordered through the SCIENTIFIC AMERICAN Office.

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On a Few Remarkable Statues.

The conception of monumental work seems to be characteristic of a certain degree of advancement in the civilization of peoples. The ancients erected many immense works in honor of their divinities. With them the majesty of a god often seemed to depend upon the size of his image; but the latter always sought to express power and majesty. The most imposing statues were given to the most powerful and dreaded gods.

In ancient Egypt colossi formed an essential decoration of the great temples and palaces. They were represented in a calm and uniform attitude, either seated or standing, the bust straight, the legs close together, the arms close to the body, and the hands extended upon the thighs or resting upon the knees.

All details that were judged useless were suppressed without consideration in order to bring into prominence the simplicity of the lines and the extent of the surfaces. The style was sober, broad, and severe, and if the statues represented individuals, it was man already stripped of his terrestrial character and arrived at the divine state.

Aside from its great pyramids, its 100 foot high obelisk, its gigantic tombs, and its innumerable and enormous sphinxes, Egypt was covered with statues 160 feet in height, carved out of a single block of stone.

Herodotus mentions a colossus of Osiris which was 93 feet in height. A few years ago there was exhumed at Memphis a granite statue of Ramses II., which must have been 49 feet in height. Before the entrance to the palace of Luxor there were seated four similar colossi 40 feet in height. Near Gournah there are still to be seen the fragments of a gigantic statue of Ramses the Great, represented seated. It was cut from a single piece of rose granite, and must have been 57 feet in height and have weighed more than 2,000,000 pounds.

Finally, we may cite the two colossi of Memnon, which, although seated, each measured more than 62 feet in height, and, with their pedestal, had a weight of more than 2,800,000 pounds.

The Egyptians employed stone almost exclusively, although they were acquainted with the art of casting and working bronze.

The Greeks likewise erected many statues to their divinities, which were in most cases of bronze, or covered with plates of gold and ivory. Their most celebrated sculptors adopted the colossal type. The Minerva of Phidias was 37 feet in height. In reality it was a wooden statue supported by an internal trussing of iron, and covered with golden plates *repousse* with the hammer and chased, and with plates of finely carved ivory. It was so accurately fitted together that it was impossible to detect the joints.

The celebrated Jupiter Olympius of the same sculptor was likewise of gold and ivory. The god was represented seated, and was 40 feet in height.

Phidias also constructed several colossal Minervas, one of which, the Athena of Promachos, was 50 or 60 feet in height.

The famous colossus of Rhodes, the work of Chares of Lindus, was erected 300 years before Christ, in honor of Apollo. It was of bronze, and passed for one of the seven wonders of the world. Its feet rested upon the two moles which formed the entrance to the harbor, and ships passed full sail between its legs. It was 105 feet in height, and everything in equal proportion, and few could clasp around its thumb. It took 12 years to make it. A winding staircase ran to the top, from which could easily be discerned the shores of Syria and the ships that sailed on the coast of Egypt, by the help of glasses which were hung on the statue's neck. Notwithstanding that it was ballasted with stones to secure stability, it was partly destroyed by an earthquake B. C. 224. Its remains are said to have been sold A. D. 672 by the Saracens, who were masters of the island, to a Jewish merchant of Edessa, who loaded 900 camels with the metal, whose value had been estimated at what would be represented in United States money by $180,000.

Rome, especially under the empire, erected many colossal bronze statues, representing in most cases Cæsars that had been deified even while living. That of Nero by Zenodorus was 110 feet in height.

In Japan there is a brass statue of Buddha, represented seated, which is 50 feet in height. In India and China most of the gigantic idols are of masonry or of roughly carved wood.

In the middle ages there were the Saint Christophers that were erected at the entrance to many churches, and the great statues of Roland.

In modern times colossal statues have generally been constructed only when the distance from the point of view rendered it necessary to increase the proportions. Several celebrated artists have often felt the need of joining material grandeur to that of expression.

In the first rank of these stands Michael Angelo, of whose work we shall cite only his David, in marble, more than 16 feet in height, his bronze statue of Julius II., three times the size of life, and his Moses—the *chef d'œuvre* of modern sculpture.

At Villa Pratolino, near Florence, there is a much admired stone statue of Jupiter Pluvius, 70 feet in height, from the chisel of Jean de Bologne.

Almost all the most recent colossal statues have been cast in bronze. We may cite the following:

The equestrian statue of Peter the Great by Falconet (1766), at St. Petersburg. The figure of the Czar is 12 feet and the horse 18 feet in height. The entire group weighs 39,600 pounds.

The statue of Bavaria, inaugurated in 1850, near Zurich. This is 52 feet in height and weighs 1,560 hundredweight. The plaster model was divided into 15 pieces for moulding in bronze, and this latter operation took about six years.

The Virgin of the Puy, a work of the sculptor Bonassieux, inaugurated in 1860. The height of this is 52 feet, and its weight 220,000 pounds.

Finally, the colossal statue of Arminius, inaugurated in 1875 upon the summit of the Grotenburg, near Detmold, Westphalia. The height of this is about 65 feet, not including the sword, which measures nearly 25 feet. The weight of the whole is 237 hundredweight.

The most remarkable example of the use of *repousse* work in colossal statuary is certainly the St. Charles Borromeo of the sculptor Cerani, which was erected in 1697 near Arona. In its construction this statue much resembles Bartholdi's Liberty; so it merits particular mention. Its height is 76 feet, or, including the pedestal, 115 feet. The length of the arm is 30 feet, that of the nose 33 inches, and that of the forefinger 6 feet.

The statue is of *repousse* copper supported, through iron cramps and trussing, by internal masonry which is nearly tangent to the copper shell, and which rises as far as to the neck. The copper plates are but 0·06 inch thick. They did not have to be hammered over patterns, but directly by hand. These plates are quite boldly joined by large rivets 1·6 inches apart. They are connected directly with the masonry by means of eye bolts and hooks. The right arm, which is nearly horizontal, is supported by a large oak beam, of 14 x 15 inches section, sealed into the masonry, and provided with flat irons, like the yard of a ship. This beam is supported by rods sealed into the masonry. The wood is now rotten, and will have to be replaced. The left hand, which holds a book, is supported by three iron rods suspended from a beam that is sealed into the masonry.

The statue is entered through an aperture hidden under a fold in the alb, and which is reached by a ladder. The ascent is very difficult.

As regards other recently constructed statues of hammered copper, we hardly need cite any but the one erected at Alise-Sainte-Reine in honor of Vercingetorix, the heroic defender of the Gauls. Its height is 23 feet. —*Abstract from Le Genie Civil.*

Hot Weather Diet.

A new publication called *The Cook*, which is supposed to be good authority in all cuisine matters, says that housekeeping presents more varied difficulties to the young housekeeper in summer than at any other season of the year. It is the season when heavy joints should be eschewed, and light, tempting viands, arranged in neat, appetizing form, served in their stead.

Summer menus are much more difficult to arrange than others, as our systems demand cooling viands. There is nothing more acceptable than cold meats, such as cold roast lamb, cold roast squabs and chickens, and among cold vegetables, cold asparagus. These if neatly arranged on the dishes and prettily garnished, if with nothing other than a few fruit blossoms, will please the eye and more easily tempt the palate. Salads present an endless array of good cheer during summer, and are most acceptable. A liberal diet of fresh, thoroughly ripe fruit is of the highest importance to most of us, but care must be exercised not to eat too heartily of it at any one meal. Vast quantities of liquids should be avoided when fruit has been eaten.

At no season of the year is it more important to have good, reliable servants than in summer. If they condescend to remain in the city, it is with reluctance and an increase of salary. The summer presents to them visions of sea beaches, green fields, and flirtations, not to be cast aside without strong financial inducements, and even then they feel and act like caged birds struggling to be free. Consequently watchfulness greater than at other times must be exercised, to see that they do not neglect the proper care that food should receive at this season. Viands of all kinds should be purchased from day to day, and delivered early in the morning or after sundown. When this is not possible, one should have a good sized ice box capable of holding a good supply of ice. It should be so arranged that milk, butter, etc., are separated from meats and vegetables. When huddled together, they lose their identity, so far as their individual flavors are concerned, and become tainted with the flavor of one another. This is particularly true of milk and butter, which rapidly absorb impure or obnoxious flavors. Cleanliness is nowhere more important than in the ice box, which should be thoroughly scrubbed at least twice a week.

Milk is a very important summer diet, but should be used in moderation, or it is liable to produce ill effects. Drink it in small mouthfuls, and rest a moment between them. Dyspeptic persons are advised to beat the milk a few moments before drinking. This treatment breaks the butter globules, and renders digestion easier. We strongly recommend skimmed milk and fresh buttermilk as summer drinks instead of ice water. The ice water dyspepsia, a common malady during the summer months, may be entirely relieved by using small quantities of freshly churned buttermilk accompanied by what is known as a moderately dry diet.

Breakfast should not be a heavy meal, and hot food should be used in moderation. Hot tea and coffee liberally partaken of prevent one from feeling comfortable all day. Radishes ice cold, oatmeal crackers and milk, a dainty slice of cold lamb, fresh fruit, and cold asparagus, presents a breakfast menu that makes hot weather a luxury.

British Naval Guns.

The Woolwich correspondent of the London *Times* writes: The new guns which have been designed to maintain the naval supremacy of Great Britain are in an advanced state, but they have to undergo a course of experiments to settle the range tables and other particulars, and it will probably be the beginning of next year before they are ready for sea. This will, however, be earlier than the ships which are to carry them can be completed, and there will be ample time available for a full and leisurely study of their requirements and capabilities.

The first of the four 63 ton steel breech loaders for Her Majesty's ship Rodney will be shortly finished, and will be used as an experimental gun, care being taken that it is not damaged in the process by any of the surgical operations to which experimental guns are occasionally subjected. Although 17 tons lighter than the 80 ton muzzle loaders on board the Inflexible, the 63 ton gun is expected to surpass the older weapon in its destructive power. It will probably throw a 13¼ inch shot, of 1,250 lb. weight, with a powder charge of about 580 lb., and the estimated velocity at the muzzle is to be 2,100 feet per second. The 80 ton gun projectile weighs 1,700 lb., but the cartridge is but 450 lb., and the muzzle velocity recorded is 1,600 feet per second. Should the new gun realize expectations, it will penetrate 29 inches of wrought iron armor at close quarters, and prove too much for 27 inches even at the liberal fighting range of 1,000 yards.

Still more powerful, but not in the same ratio of increase, will be the 110 guns now being manufactured for Her Majesty's ship Benbow. There are three of these guns ordered, one of which will be surrendered for the purpose of scientific experiment, while the other two are sent on board ship, where, however, they will not be wanted until the midsummer of 1886. The projectile will be 16¼ inches diameter, and weigh 1,800 or 2,000 lb. The powder charge will be the enormous one of 900 lb., or half the weight of the projectile, supposing this to be 1,800 lb., on which supposition the velocity may be reckoned at 2,050 feet per second, and its power of penetrating armor at 31½ inches near the muzzle, or 2 inches less at 1,000 yards. The new guns will be greatly superior to the Italian 100 ton guns, which are at present at the head of all the naval artillery in the world, and they are also in advance of the 100 ton guns which are doing duty for England on the fortifications of Malta and Gibraltar, although these are larger in the bore by 1½ inches. The substitution of steel for wrought iron admits of heavier charges of powder, and this fact makes all the difference. Two huge sleighs for the proof trials of these and similar guns are being built—the one for use at Woolwich and the other for Shoeburyness, whither both the experimental guns just mentioned will sent for practice at the sea ranges. To Shoeburyness there is also to be immediately sent the 80 ton gun which has been returned to Woolwich from the Inflexible. The inner tube of the gun is unquestionably cracked, but this is regarded as a comparatively small injury, and before it is repaired the gun will be fired with a series of heavy charges at the targets which have been put up at Shoeburyness to represent the Spithead forts. These targets, which are respectively faced with granite, wrought iron plates, and compound steel, have already been attacked in a course of earlier experiments, and the compound steel has shown to very great advantage. The double barge Magog will, as heretofore, convey the 80 ton gun, but for the 110 ton gun a still larger craft is being built, which is to be called the Gog, and measures 20 feet longer than the Magog.

SOMEBODY has said, what everybody has observed, that those persons who have attained to eminence in any vocation of life have followed a uniform course, that of earnest work and unwearied application. None are truly happy but those that are busy; for the only real happiness lies in useful work of some kind, either of the hand or the head, so long as overexertion of either is avoided. It should be the aim of every one to be employed. If all men and women were kept at some useful employment, there would be less sorrow and wickedness in the world.

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ENGINEERING INVENTIONS.

The propelling of marine vessels forms the subject of a patent issued to Mr. William O. Robbins, of New York city. Compressed air pipes lead from the stern of a vessel close to the propeller blades, which are made to revolve by the force of air at a high pressure, whereby only short propeller shafts are needed, and friction and danger of breakage is removed.

A car coupling has been patented by Mr. Ernest M. Brown, of New Boston, Ill. The draw bar has a head, from one side of the face of which two longitudinal slotted prongs project, and which has a coupling pin, in combination with a coupling link of an opposite drawhead, so the cars are at all times coupled by two links, and the pins have considerable play in the links.

A car brake and starter has been patented by Mr. Eyvind Lee Heidenreich, of Chicago, Ill. Combined with the axle is a sliding sleeve having clutch cups at its ends which can be engaged with clutches mounted loosely on the axle and engaging with a wheel in which a spiral spring is coiled, so the energy of the car's motion while being stopped is stored to be given out in helping to start the car again.

A car coupling has been patented by Mr. Joseph McCoy, of Independence, Mo. Combined with the drawhead is a V-shaped link lifter pivoted on the bottom and connected with a swinging piece arranged at one side of the drawhead, while on the opposite side is a horizontal bar with a beveled head projecting beyond the end of the drawhead, the device being intended to both raise the link and couple automatically.

A railroad gate has been patented by Mr. Albert M. Woodruff, of Athens, Mich. It is made with a shaft having a staple and rigid arms carrying suspended weights, with a push bar and springs so arranged and connected with supports attached to the track that the gate will be opened by the wheels of an approaching train, held open while the train is passing, and then automatically closed.

A valve gear has been patented by Mr. John R. Deering, of Emporia, Mo. The construction is such that the valve will be fully moved by an eccentric during an eighth of a revolution of the shaft, and will remain still until the eccentric reaches the opposite side, so the exhaust will be open for three-quarters of the time of revolution, thus giving an exceptionally free exhaust and reducing the back pressure on the piston to a minimum.

A car coupling has been patented by Mr. John O'Brien, of Austin, Minn. A shaft is journaled in the top part of the drawhead in front of the coupling pin, carrying a plate whose free edge projects toward the rear of the drawhead, adapted to lift the outer end of the link when the shaft is turned, with which are other novel features, the device being calculated to facilitate the coupling of cars having drawheads of unequal heights.

A railway and tramway chair has been patented by Mr. John Poyser, of Sherwood Rise, Mansfield, Nottingham County, England. It is made with three jaws formed in one piece with or rigidly attached to an ordinary base, one jaw being shaped to receive one side of the rail in the usual way, and the two jaws on the other side leaving sufficient space to allow of the easy admission and extraction of the rail, a wooden or metal key being driven in this space to fix the rail firmly in position.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Messrs. Edwin M. Calef and Truman L. Tracy, of Missouri Valley, Iowa. This invention covers a novel construction and arrangement of parts intended to facilitate the planting of corn in accurate check row, and promote convenience in adjusting the seed dropping mechanism to keep the cross rows in line.

A mower has been patented by Mr. Benjamin Saunders, of Claverack, N. Y. The axle and main gear wheel are connected by a ratchet wheel, and spring pressed pawls are pivoted to the radial arms of a hub, so arranged that the main gear wheel can be driven at a fast or slow speed, and the sickle bar thus be made to vibrate more or less quickly, as the character of the grass may require, without stopping the machine.

A cotton chopper has been patented by Mr. James F. Barringer, of Bennettsville, S. C. It is made with wheels and an axle, runners connected by a shaft, pivoted bars, standards, and chopping hoes attached to a swinging extension bar vibrated by a crank shaft driven from the wheels and axle, making a machine to facilitate the chopping of cotton to a stand, and one which can be conveniently adjusted, operated, and controlled.

MISCELLANEOUS INVENTIONS.

A belt clasp has been patented by Mr. George E. Zeltmacher, of Brooklyn, N. Y. A peculiarly made slide is so combined with the buckle that the clasp can be readily adjusted to lengthen and shorten the belt, which will remain as fixed when adjusted, and the belt will not be disfigured or otherwise injured.

A hasp lock has been patented by Mr. Charles P. Pond, of Camden, N. Y. Combined with a hasp, a lock is formed in the swinging end of the same, no key being required to lock the hasp, and the improvement covering a lock which is simple in construction, strong and durable, and one which can be used on numerous objects.

A nail extractor has been patented by Mr. Lewis Howard, of Watkins, N. Y. Combined with a claw bar, with a spring bit secured to its under side, a clevis is pivoted to the bit, and a pin unites the shank of the clevis between the bit and the under side of the bar, making an improved device for extracting nails and spikes easily and rapidly.

A wire frame has been patented by Mr. Henry F. Fordham, of Greenport, N. Y. This invention consists principally in holding the ends of the wires with a tube and wedge, key, or rivet, in making frames with wires that radiate from a central point, so that the wires will be held very firmly at the center of the frame, and the frame will be cheap and strong.

A convertible chair has been patented by Mr. Edward H. Lewis, of Nashville, Tenn. It is a folding chair of novel design, readily convertible into a settee, bed, or cot, a lounge, a child's crib, or a carpet or wall paper exhibiting frame; it is composed of three main bent sections, which may be put together without tenons or mortising, glued angles, or ordinary framing.

A backing for books has been patented by Mr. Gustav A. Shurmann, of New York city. It consists of wood or other suitable material provided with removable attaching strips for holding the leaves, furnishing a device for binding in a firm and substantial manner, and in such way that the leaves or body of the book can be removed from the covers.

A carriage seat has been patented by Mr. Charles Morgan, of Bridgewater, Nova Scotia, Canada. The frame of the seat is so arranged, in connection with the use of springs, that it is adapted to slide back a little when the carriage receives a sudden shock or jerk, and then again return to its place, thus easing the back of the person occupying the seat.

A composition of matter for facing brownstone and for making artificial stone has been patented by Mr. Benjamin E. Ratcliffe, of New York city. It consists of linseed oil, sand, and litharge, in specified proportions, with any desired pigment for coloring, and if a finer grained mixture is required, ground pumice stone is added.

A grindstone frame has been patented by Mr. Julius B. Johnson, of Johnson, Neb. It is a knockdown frame which can be readily put together, the sides of the frame having oppositely arranged grooves down their inner faces, near each end, with which, by reason of the construction and fit of the legs, cross end pieces to keep the sides at their proper distances apart are dispensed with.

A stair rod has been patented by Mr. Thomas Worley, of New York city. It is made with interior screw threads in each end, the screws to fit therein having radial perforations in their shanks, with caps having flanged outer ends and transverse slots to inclose the screws and the ends of the rod, so that such rods may be readily applied and removed, and will hold the carpet firmly.

A disinfecting compound has been patented by Mr. Ferdinand Jossa, of Boston, Mass. It consists of definite mixtures of sulphate of iron, borax, chloride of sodium, and bicarbonate of soda, dissolved in warm water and mixed with dry sulphate of lime, the compound being suitable for use as a powder, in hard cakes, or dissolved in water according to the strength required.

A hose reel has been patented by Mr. Luther C. Baldwin, of Manchester, N. H. A U-shaped support, made of gas pipe or other suitable material, is attached to the side of a building or to the ground, supported from the bowed portion, the arms holding a roller which has a crank for winding the hose, the device being fixed near a faucet or hydrant, to facilitate the use of small hose in sprinkling, washing, etc.

Saddle bags form the subject of a patent issued to Mr. Joseph J. Stephens, of Coalesburg, Mo. The bag is made open at the top, with a low front wall, in which is a cover opening on links as a tray, the whole affording a convenient receptacle for vials and other articles, while there is a flap cover which swings over the top and front of the tray and fastens to the front of the body.

A safety lamp has been patented by Mr. John L. Williams, of Shenandoah, Pa. This invention covers novel attachments arranged outside of the wire gauze cylinder of the lamp, with adjustable sleeve on the wick tube to afford safety against a rush of gas, also an extension of the gauze cylinder below the burner, an additional wire gauze protector at the top of the lamp, with other novel features.

A combined wire stretcher and staple puller has been patented by Ela Moore, of Walla Walla, Washington Ter. The handle has teeth and a clamping lever, in combination with a fulcrum plate or head made on a curve, having at one end a hook and at the under side of the opposite end a depending pawl, making an especially useful device for building and repairing fences.

A machine for sorting feathers has been patented by Mr. Henry C. Dyer, of St. Louis, Mo. There is a chamber with means for agitating the feathers, and a blower for making a current of air which carries off the lighter feathers and allows the heavier ones to drop into a pit, there being rollers and belts with pins over which the feathers are conducted, the larger ones catching on the pins and dropping down.

A ruler attachment for slates has been patented by Mr. Joseph R. Kennedy, of Philadelphia, Pa. The ruler is formed with a straight tube and spring tongues, the latter adapted to enter a slot in the edge of the slate frame, the device being such as not to interfere with the ordinary use of a slate, while adapted to hold a pencil and sharpener, and also for use as a ruler and measuring implement.

A revolving chair has been patented by Mr. C. Arnold Graef, of Bay Ridge, N. Y. A lever pawl is pivoted to the socket attached to the legs, and engages with side rack teeth upon the pivot bar, passing through the socket and carrying a pivoted seat spider, whereby the bar will be securely supported and can be readily raised and lowered, and the chain will remain at the desired height.

A windmill has been patented by Mr. James E. Goodhue, of St. Charles, Ill. It is a self-regulating mill of the class known as "solid wheel" mills, and its construction is such that the mill may be promptly stopped during heavy or light winds, while the vane maintains its position in line with the wind, with various other novel features to improve the construction and promote the efficiency of windmills.

A grappling bucket has been patented by Mr. William G. Thompson, of Brooklyn, N. Y. It is made with a foot block carrying the bucket arms, a head block carrying connecting bars and pulleys, and a hoisting rope so contrived to run that the bucket can be controlled by a single rope or chain, and will be opened and closed automatically, the apparatus being inexpensive to manufacture and its working easily controlled.

A carriage axle and box have been patented by Mr. Josiah Fowler, of St. John, N. B., Canada. The outer end of the axle has no screw or nut to hold the wheel in place, but instead there is a screw cap slipped over the bed of the axle, which is screwed by an external thread into the hub of the wheel and by an internal thread into the inner and larger end of the axle box, with other novel features, to promote durability and noiseless running.

A sweat pad for horse collars has been patented by Mr. Edward L. McClain, of Greenfield, O. A corrugated strap, preferably of rubber, is attached to a sweat pad, the strip being adapted to be brought around the inner roll of the collar and passed under the hames, so as to be held between the hames and the collar, the attachment being thickest at its outer or free end, so it will have a wedging action between the hame and collar.

The marking of chocolate cream drops and other confectionery forms the subject of a patent issued to Messrs. John S. Hawley, of Brick Church, N. J., and Herman W. Hoops, of New York city. The marks are impressed upon paper, upon which the cream drops or other confectionery are laid while warm and plastic, and upon cooling and hardening preserve impressions of the figures of the struck up or impressed paper on which they have been laid.

A folding crib has been patented by Mary E. Woodward, of Parker, Dakota Ter. It is formed of two sides and two end pieces, each having at each end a corner piece with triangular cross section, the corner pieces hinged together in pairs, and bottom boards being hinged to swing upward to the bottom rails of the side pieces, making a child's crib that can be folded compactly, quickly set up, and will then stand firmly.

A machine for cutting cloth, leather, and other substances has been patented by Mr. Charles Goettler, of New York city. Combined with a horizontal shaft mounted in fixed bearings, with a feed roller, is another vertically adjustable shaft with feed roller, and a knife held adjacent to the outer sides of the rollers, with other novel features, so the material will be cut smoothly as it is drawn against the edge of the knife by the feed rollers.

A magazine spring gun has been patented by Mr. Stephen D. Engle, of Hazleton, Pa. The magazine, to contain balls or projectiles, may be a simple longitudinally bored extension of the stock, connecting with the barrel at the breech, and allows one ball at a time to pass into the bore on suitably elevating the muzzle, when the follower or driver is in position, the propelling springs, which act in unison, giving an extended and powerful throw.

A stove has been patented by Messrs. Burt A. Brigden and Edwin Cannon, Jr., of Moravia, N. Y. Around the fire pot, and low down, is fitted a horizontal partition, cutting off all passage of gases from the coal to the smoke flue except through the fire pot and grate, the smoke flue being below the line of the partition, the stove being intended to economize fuel by consuming the gases, while being simple in construction.

A horse collar has been patented by Mr. Ebenezer Fisher, of Philadelphia, Pa. This invention covers a steel horse collar of two sections, each forged from a sheet of steel to form thin side flanges, whereby a greater degree of spring action is provided for the draught attachments, with other novel features, embodying improvements on a collar which has been the subject of several former patents by the same inventor.

A windmill has been patented by Mr. Oren Stoddard, of Busti, N. Y. By this invention it is designed to utilize the ornamental towers of buildings to locate wheels, vanes being suitably pivoted to arms to swing edgewise to the wind on the returning side, with two doors for each side closing to the center plane of the wheel, and so that only the ordinary form of the tower will appear when the doors are closed and the wheel not in use.

An odometer has been patented by Mr. Benjamin F. Hutches, Jr., of Galveston, Texas. It is a simple, compact instrument, with geared wheels and dials, for attachment to bicycles, carriages, cars, etc., for registering the distance traveled, and will register the distance either forward or backward, up to tens or hundreds of thousands of miles if required, without requiring special adjustment of the registering mechanism.

A photographic camera has been patented by Mr. Thomas Samuels, of Hadley-Monken, Middlesex County, England. The lens is so supported as to swing both on a horizontal and on a vertical axis, with vertical and horizontal adjustments, whereby the same results may be obtained as by the combined use of sliding fronts and swing backs, the bellows body of the camera readily lending itself to any desired adjustment of the lens.

An apparatus for transmitting power has been patented by Mr. Louis G. C. y Saenz, of Puebla, Mex. This invention combines a rotatable shaft provided with a power accumulating balance wheel, one or more disks being fast on the shaft, and one or more loose balls carrying reciprocating tapering pockets constructed to receive the disks partly within them and between the balls in the pockets, with other novel features to promote the accumulating and transmission of power.

An ore separating and concentrating machine has been patented by Mr. Henry Landrin, of Anglet, Basses-Pyrenees, France. It works on the gravity principle, a hollow vessel being held in an upright position in a frame, the upper third of the vessel being cylindrical, and the lower two-thirds tapered toward the bottom, a hopper being in the upper part, the bottom of the hopper formed of sector-shaped wings, and an arm or rake being held above its floor, while the hopper may be revolved around a shaft, with other novel features.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

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NEW BOOKS AND PUBLICATIONS.

COMMERCIAL ORGANIC ANALYSIS. Vol. I. By Alfred H. Allen. P. Blakiston Son & Co., Philadelphia.

This is the commencement of a revised edition of a standard work, containing much later and additional information. It is intended now to treat the whole subject matter in three separate volumes, this one taking up bodies of the fatty series and of vegetable origin, and including chapters on the alcohols, ethers, and other neutral derivatives of the alcohols, sugars, starch, and vegetable acids. The work will be found especially valuable to manufacturers whose business requires any knowledge of chemical manipulations, and to all who have to examine commercial organic products for the detection of adulterations or sophistications of any kind.

THE WINDMILL AS A PRIME MOVER. By Alfred R. Wolff. John Wiley & Sons, New York.

This work gives a fairly complete elucidation of the mathematics of windmill construction, as necessary for the engineer, together with a history of the introduction of windmills, and accounts, with practical illustrations, of most of the more recent windmills which have been introduced in recent years in this and other countries.

MECHANICS OF MATERIALS, AND OF BEAMS, COLUMNS, AND SHAFTS. By Mansfield Merriman. John Wiley & Sons, New York.

This is a text book for the study of such only as have had a good training in mathematics and theoretical mechanics. It is designed for the use of classes in technical schools and colleges, and problems follow each article to enable the student to become well grounded in the theories stated.

THE ANGLER'S GUIDE BOOK. Compiled and edited by W. C. Harris. The Anglers' Publishing Company, 252 Broadway, New York. 288 pages. Price $1.00.

This is a very complete and useful book for persons having the propensity for fishing. It gives over 2,000 center points from whence over 7,000 angling waters are more or less accessible. It tells how to reach these points, the species of fish most abundant, the best months for angling, the kind of baits or flies to use, list of hotels or boarding houses with their charges, cost of guides, boats, and baits where necessary, and the cost of permits for fishing where required.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) E. E. W.—We think the steel and brass strips soldered together for a thermostatic bar the most sensitive, and of longer range than the bowed wire. For a hygrometer use a strip of flat sheep gut stretched across the inside of the incubator, with one end fast and the other hung by a light spring, using the movement of the point of attachment as an index.

(2) F. S. M. asks how acid coloring is done on gold. A. For small gold articles a very good plan is to place them on a lump of charcoal and make them red hot under the blow pipe flame, and then to throw them into a pickle composed of about 35 drops strong sulphuric acid to 1 ounce water, allowing the articles to remain therein until the color is sufficiently enhanced; washing the article in warm water in which a little potash has been dissolved, using a brush, and finally rinsing and drying in boxwood sawdust, completes the operation. See also Spons' Workshop Receipts, second series, which we can send for $2.00.

(3) D. D. L. writes: Some time ago you gave a cure for corns—collodion, salicylic acid and Cannabis indica. I find it takes a long time to dissolve. A. The proper formula is as follows:

Extract of Cannabis indica	5 parts.
Salicylic acid	30 "
Collodion	240 "

Mix and dissolve. The result is a clear light green solution. There should be no difficulty in its preparation. To prevent it from evaporating, keep the solution in a stoppered bottle. Be sure and use the Indian hemp, and not the American article; the latter is not easily soluble.

(4) A. A. O. asks if he could manufacture glue from dog fish. A. Glue is largely made from the skins and refuse of fish in the same way that ordinary glue is prepared from the skins and offal of land animals. Thus far, however, it has been found impossible to free it from the disagreeable fish-like odor, and also it does not gelatinize satisfactorily. In the East the scales of fish are thoroughly washed and placed in a glazed earthen jar, which is stoppered tightly and weighted so that it will remain under water. This jar is then placed in a pot of water until the scales are reduced to a semi-transparent viscous mass. Care should be taken that no water or extraneous matter, fluid or solid, be allowed to get into the jar with the scales. Consult also "A Practical Treatise on the Raw Materials and Fabrication of Glue, Gelatine," etc., price $2.50, by F. Dawidowsky.

(5) H. V. A. asks for directions for making a small mine lamp. A. To make a phosphorus lamp, dissolve 24 grains of phosphorus in an ounce of olive or cottonseed oil. The mixing should take place in a thin flask, which must be placed in hot water. When the phosphorus melts, cork the vial and shake vigorously until nearly cold. Upon being uncorked it emits considerable light. This preparation is an exceeding dangerous operation, and one demanding experience in the manipulation of chemicals.

(6) H. S. S., Jr., asks: 1. Would it be dangerous, in case of lightning, to run a wire cable from the roof of one block across the street to roof of another, both roofs being tin? A. Unless both roofs are well connected with the ground, the lightning striking one roof might be conducted to the other, thence through the house, doing damage. 2. What result do we obtain by mixing a solution of acetate of lead and a solution of sulphate of zinc? A. A precipitate of lead sulphate.

(7) C. G.—Silver is platinized as follows: Place some platinum in a small quantity of aqua regia or nitrohydrochloric acid, and keep it in a warm place for a few days, when it will have dissolved. As soon as it has dissolved, evaporate the liquid at a gentle heat until it is as thick as honey, so as to get rid of the excess of the nitric and hydrochloric acids. Add a little water, and it is ready for use. A dozen drops of this solution goes a long way in platinizing silver. The operation is performed in a small glass or beaker, covered with a watch glass to keep in the fumes, and placed in a little sand in a saucer to equalize the heat.

(8) W. J. G. asks: 1. I would like a receipt for a varnish suitable to revarnish walnut barber chairs. I want it so it will stain the bruised parts and will dry quick. A. Use either of the following: 1. Shellac 1½ pounds, naphtha 1 gallon; dissolve, and it is ready for use without filtering. 2. Shellac 2 pounds, benzoin 4 ounces, spirit 1 gallon. Either of the foregoing makes excellent furniture varnish. It is best, however, to first thoroughly remove all varnish and other matter on the wood before applying a new coat of varnish. 2. A receipt book giving receipts for making hair dyes, oils, cosmetics, pomades, etc., for barbers' use. A. There is a comprehensive treatise on perfumery and kindred arts by R. S. Cristiani, which we can send for $5.00.

(9) A. D. asks how to clean and polish sea shells, and what acids are used, if any? A. Shells are cleaned as follows: Make a lye by boiling strong ashes; allow it to settle, pour the lye over the shells, and boil them six or seven hours, or longer, if they are large; then soak, and wash often in fresh water. Dilute acids, such as hydrochloric acid, mixed with from ten to twenty parts water, will readily eat away any portion of the shell. If polishing is necessary, a little pumice stone and oil will make the surface smooth where desired.

(10) A. B. S. writes: There were formerly on the market maps of the Holy Land, the uneven topography shown in relief. After the plates were lithographed, how was this done? A. The maps you describe are probably first made in clay, from which a plaster cast is taken. Into this female cast the paper pulp is forced, and the resulting cast constitutes the map. The engraved sheet is wetted, then stretched over the model, and glued down, the paper giving wherever necessary.

(11) J. B. writes: I wish to run a steam pipe from my boiler to lint room in gin house. I wish to use this in case of fire. Would it be necessary to have the lint room very tight for the steam to extinguish fire? A. It is not necessary to have the gin house tight, but it is well to have the pipe pass around the gin room and terminate under the gin, with perforations at various points so as to distribute the steam quickly.

(12) C. E. P. writes: Is there a way of putting up hydrochloric acid in a dry form so it can be made into solution with water? I think there may be some powdered substance that will not change the character of the acid. It is used in the following way for the removal of tattoo marks on the skin: "Make a salve of acetic acid and lard, with which anoint the part marked, then rub vigorously with a solution of potash, and finally with diluted hydrochloric acid. A. Hydrochloric acid itself is a gas, and the acid of commerce is simply an aqueous solution of the gas. No practical method exists by which the gas can be used in the dry form. We do not believe that tattoo marks can be removed by the method suggested. As regards the preparation of such an ointment, the simplest plan would be to have it prepared by a pharmacist. The ordinary dilute solutions are made in the proportion of one of the substance to ten of water.

(13) L. H. S. desires a recipe for preventing mildew in blotting paper used in copying letters. A. If you dry the paper thoroughly in a current of air, no mildew spots should appear. As the mildew is a fungous growth, dipping the paper into some convenient disinfectant should be all that is necessary. A solution of zinc chloride, carbolic acid, oil of cloves, etc., we should think would prevent its appearance.

(14) G. H. asks: What is used to fill out little holes in cast iron to make it smooth, before japanning same? A. Fill the holes with iron putty made of iron filings or cast iron borings and boiled linseed oil or a little japan varnish. Make the putty as hard as possible; fill the holes, and bake to harden. When hard, smooth with sand paper, when it will be ready for japanning.

(15) J. A. A.—Wood engraving is one of the most difficult of occupations to become an expert in—much more so than an ordinary trade—and one seldom becomes moderately proficient in less than four or five years. There is always a demand for the better class of workmen, who are necessarily in some measure artists, but of poor engravers there is never any scarcity, and the price varies proportionately. There are classes in wood engraving for females at the Cooper Institute, New York, but practical wood engravers engaging to teach the business usually require a fixed sum therefor and a long time of gratuitous work.

(16) J. P.—The water percolating from a zinc lined refrigerator should not be used. It is undoubtedly poisonous, and the flavor is anything but palatable. Make a heavy tin plate box soldered with pure tin, with a close cover, fill with water and ice and set it in the ice box. A small butter jar with cover will be still better.

(17) H. A. L. asks how to remedy clothes which have become shiny. A. The shininess is generally due to wear, and under such circumstances cannot be restored. The following reviver may prove useful, however: Take of blue galls bruised 4 ounces, logwood, copperas, iron filings free from grease, each 1 ounce. Put all but the iron filings and copperas into 1 quart good vinegar, and set the vessel containing them in a warm water bath for twenty-four hours; then add the iron filings and copperas and shake occasionally for a week. The preparation should be kept in a well corked bottle. It may be applied to faded spots with a soft sponge.

(18) Scud asks: What can I coat a muslin bag with that will make it air tight, and also flexible, so that when not inflated it may be rolled and carried without breaking? A. Take 1½ ounces of finely cut shreds of India rubber and 1 pint of either chloroform, washed ether, or carbon disulphide; digest in the cold until solution is complete. It will dry as soon as it is laid on. Pure gutta percha may be substituted for the India rubber.

(19) W. F. B. asks: 1. If a nickel solution be made according to Mr. Weston's process, as described in SUPPLEMENT, No. 192, and 10 ounces of chloride of nickel be used with 4 ounces of boracic acid, what would be the amount of water required to make the solution? A. Use 1 gallon of water to 1 pound of the crystals. The exact quantity of water is not important, for the reason that just as fast as the nickel is deposited on the object to be plated the nickel anode gives up an equal amount of nickel to the solution, so that its composition remains constant. 2. Should a nickel solution be worked hot? A. The nickel solutions are worked cold. See Alexander Watt's "Electro-Metallurgy," practically treated. Price $1.00.

(20) V. B.—We cannot recommend the quality of an objective made from plate glass, unless it was thoroughly examined and found of even density. The curves cannot be given without a knowledge of the densities or refractive and dispersive indices of both glasses. You may make the radius of all the curves about 2½ feet with one side of the flint glass flat, and then make the correction of curves by trial and observation, in the absence of more positive knowledge of the nature of the glass.

(21) W. F. B.—The trouble with steam tricycles is not with the light engine, but with the heavy boiler, water, and fuel. They have been built in England to run 8 to 10 miles an hour. We do not think you can attach an engine and boiler to any ordinary tricycle that will be of much service. The power stated would no doubt give the desired speed. Fuel, water, and attendance make the trouble.

(22) E. J. W. asks: 1. What kind of steel is used in the manufacture of French cathedral bells? A. Best tool steel. 2. Is it used in a tempered or soft condition? A. Soft. Small triangles may be hardened.

(23) J. P. A.—We do not know of any cheap way of making small boilers; whatever pattern is chosen, there should be as much pains taken to have it well done as with those of a larger size. A horizontal cylinder 15 inches diameter, 2 feet long, with lower half filled with tubes of any convenient size, can be made by a coppersmith of suitable thickness for pressure required; 6 square feet of fire surface will be sufficient for one-third horse power. We do not recommend a pipe boiler, which if made of serviceable proportions is more difficult to make than one of copper.

(24) H. S. asks: Will you be kind enough to inform me which "system of stenography" you consider the most efficient and best adapted for practical use in regard to quickness and plainness for a beginner? A. Pitman's system is largely used by newspaper reporters. Graham's and Munson's systems are likewise both extensively used.

(25) W. E. S. writes, relative to the question of the moon's presenting to the earth the same side always: There may be known conditions in this problem not within my knowledge, which forbid the following explanation, but a very simple cause would seem to be sufficient to account for this phenomenon, to wit, a greater density in that part of the moon which is next the earth, as compared with the remainder, or such a shape of the moon as gives a greater amount of material in that part, with the necessary consequence, through attraction of gravitation, of holding that part always next the earth. A. Its form may not be a perfect sphere, and it may also be overloaded on the earth's side of its center of gravity. All these conditions have been derived from its original condition of rotation, and yet we do not know the fact of its initial rotation, or why it is different from its primary.

(26) D. T. writes: I wish to prepare different chemicals by using the direct process, avoiding double decomposition. I want to make borate of quinia. What quantity of each must be used? A. The information you desire is determined by calculation. A knowledge of stoichiometry must be obtained. Thus, for instance, in the case of barium sulphate, $BaSO_4$, we find that the atomic weight of Ba is 137; of SO_4, S=32, O=16×4=64, or 96; hence barium is $\frac{137}{233}$ of 100; or 59·23, that is to say, Ba combines with SO_4 in the proportion of 59·23 of Ba to 40·77 of SO_4. Therefore in every 100 pounds of barium sulphate there are 59·23 pounds of barium and 40·77 pounds of the SO_4. In like manner you must compute from the formula of borate of quinine the exact amount of quinine necessary for your preparation. Double decomposition in most cases is far simpler than a direct process.

(27) R. asks: What is a sure destruction to the small red ant? A. Powdered borax sprinkled around the infested places will exterminate both red ants and black ants. Powdered cloves is said to drive them away. Another plan is to grease a plate with lard, and set it where these insects abound. They prefer lard to anything else, and will forsake sugar for it. Place a few sticks around the plate for the ants to climb up on. Occasionally turn the plate bottom up over the fire, and the ants will fall in with the melted lard.

(28) W. T. H.—The sample is simply unsized paper dipped in a strong solution of Prussian blue. A good bluing solution is made by taking one ounce soft Prussian blue, powder it and put it in a bottle with 1 quart of clear rain water, add ¼ ounce of oxalic acid. A teaspoonful is sufficient for a large washing.

(29) F. B. D.—In the growth of vines and plants the stalks simply enlarge at the bottom, and put out the growth from the top; they do not pull or materially stretch their stalks out—A cloudburst is only a thunder storm of great intensity. Its effects are intensified in the canons of the Rocky Mountains by their steep and rocky slopes precipitating the water into the gorges. A water spout is the sucking up of water from sea, lake, or river by a tornado, which in its turn may become a cloud burst by its precipitation at a different locality.

(30) J. F. N. wants to know all about petroleum soaps and how they are made. A. Caustic lye at 36° B. is placed in a suitable vessel, and then equal parts of animal fatty matter and mineral oil are placed in separate vessels. The combined weight of the fatty matter and the mineral oil being taken as a standard, boric acid sufficient to dissolve the alkali is used; the mineral oil is heated to a temperature of about 90° Fah., and the animal fatty matter is melted by steam heat, and while in this condition a quantity of boric acid is dissolved therein, which, with that acid used as before, will make up ½ per cent of the combined weight of the fatty matter and mineral oil employed. The partly acidified animal fatty matter and the mineral oil, being heated in separate vessels, are now united by gradually pouring the former into the latter, with constant stirring or agitation, in order to effect a perfect combination; the acidified alkali is then gradually added, and the mass kept well stirred. The process of converting the mineral oil into a solid is completed by gradually adding the ordinary or unacidified alkali in sufficient quantity to effect this result, keeping up the agitation as before. When the entire mass is found to be granulated, the conversion into a saponaceous compound is complete. While animal fatty matter only has been mentioned, the same results can be reached by the use of vegetable fatty matters. The soap is finished by the free use of steam. Liquefaction is accomplished by a jet of steam to thoroughly deoxidize the saponified matter and disintegrate the compound. After the use of steam for this purpose, the soap is boiled by superheated steam.

(31) C. H. R. desires to know the ingredients of a cement or pitch used by brush makers in cementing hair in the handles of brushes. A. Paint brushes are made by inserting a bunch of full length bristles between two projecting prongs on the handle, and securing them by a wrapping of twine which is afterward coated with a covering of glue mixed with red lead. Equal parts of asphalt and gutta percha melted together and applied hot under a press will form a black cement of considerable strength.

(32) C. E. F. desires the receipt for making and applying the gilt or lacquer that opticians and manufacturers of electrical instruments use on most of their fine brass work. A. Take ¾ ounce gamboge, 2 ounces gum sandarac, 2 ounces of gum elemi, 1 ounce of dragon's blood, 1 ounce of seed lac, 2 grains of oriental saffron, and 20 ounces of pure alcohol. The tincture of saffron is obtained by infusing in alcohol for twenty-four hours, or exposing to the heat of the sun in summer. The tincture must be strained through a piece of clean linen cloth, and ought to be strongly squeezed. This tincture is poured over the dragon's blood, the gum elemi, the seed lac, and the gamboge, all powdered.

(33) W. S. M. desires a receipt for a cement that will stick leather, something that oil or water will not affect, and at the same time is pliable and will not crack. A. Gutta percha dissolved in carbon disulphide to form a mass of treacly consistence is probably the best cement for splicing leather. The parts to be joined must be thinned down; a small quantity of the cement is then poured on each end and spread so as to thoroughly fill all pores of the leather; the parts are warmed over a fire for a few minutes, applied quickly, and hammered well together. Or gutta percha 1 pound, India rubber 4 ounces, pitch 2 ounces, shellac 1 ounce, linseed oil 2 ounces, melted together.

(34) E. N. H.—Colored or plain engravings, photographs, water colors, oil colors, crayons, show cards, labels, etc., can be transferred to glass in the following manner: Take glass that is perfectly clear, clean it thoroughly, then varnish it, taking care to have it perfectly smooth; place it where it will be entirely free from dust; let it stand over night, then take your engraving or photograph and lay it in clean water until it is wet through, say 10 or 15 minutes, then lay it upon a newspaper, that the moisture may dry upon the surface, still leaving the other side damp. Immediately varnish the glass a second time, then place the engraving upon it, pressing it down firmly so as to exclude every particle of air; next rub the paper from the back until it is of uniform thickness, so thin that you can see through it, then varnish it a third time and allow it to dry. SCIENTIFIC AMERICAN SUPPLEMENT, No. 87, describes a magic lantern to be used.

(35) G. C. K. asks: How could I prepare helenina or elecampane to make tests with it in butter to keep? If it is wholesome for veal and eggs, it must be so for butter. Would alcohol in this case be detected? A. The helenina is obtained by evaporating the alcoholic solution to crystallization. You can then mix

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about one ounce or less of the dry powdered salt with every 60 pounds of butter, and knead well. Be careful to crush all small lumps which may form, and have the substance well distributed throughout the mass. If the helenina is at all soluble in water, wash the butter with as concentrated a solution as possible, or else dilute with water the alcoholic extract and use that. The alcohol is not likely to affect the butter unless used in a concentrated form. Of course thoroughly mix the solution through the butter by kneading, etc.

(36) H. R. C. asks: Is there a point in the axis of a revolving wheel in which there is no motion? A. There seems to be much misunderstanding as to the meaning of the word axis, it being a line having neither breadth nor depth, around which a body revolves. Every particle of the body revolves or moves around its axis. The axis does not revolve. Axles revolve.

(37) W. H. D. asks (1) if worn out files can be recut by using acid? A. Yes. 2. With what success? A. Fair. 3. What acid to be used? A. 1 part nitric, 3 parts sulphuric, 7 parts water; dip from 5 seconds to 5 minutes. 4. What can be used in place of oil on the drawing and blanking dies? The oil touching certain rubber parts rots the rubber. A. Glycerine.

(38) W. M. B. asks for an easy and cheap way to clean beer bottles, that is, what can I put in water to make them become clean, and at the same time remove old labels, etc.? A. At factories where beer is bottled, the empties are cleaned by means of a revolving brush, which is pushed in through the mouth of the bottle, turned around once or twice, and then withdrawn. The labels are acted upon by simply soaking in water and then scraping with knives. If the bottles are contaminated with grease, alkalies are used to cleanse them, and sometimes acids are used, but we believe as a general thing that nothing but water is employed. See the article "How to Clean Bottles," SCIENTIFIC AMERICAN SUPPLEMENT, No. 318.

(39) C. D. writes: There is a bet between two miners here who are working Burleigh drills. A claims that there is more pressure in a 2½ inch pipe—a conductor of compressed air—than in the ¾ inch pipe leading from it. B claims that the pressure is not reduced by transmission into the smaller pipe. How is it? A. If the drill is not at work, the pressure is uniform throughout the various sized pipes. If a drill is running by a ¾ branch from a 2½ inch pipe, the pressure is less in the ¾ pipe than in the 2½ inch main—the amount depending upon the speed of the drill or the relative velocities of the air moving through the two pipes.

(40) J. H. desires a recipe to make Persian sherbet powders. A. We presume you refer to the following: Take 8 ounces carbonate of soda, 6 ounces tartaric acid, 2 pounds loaf sugar (finely powdered), 3 drachms essence of lemon. Let the powders be very dry. Mix them intimately, and keep them for use in a wide mouthed bottle, closely corked. Put 2 good sized teaspoonfuls into a tumbler, pour in ½ pint of cold water, stir briskly, and drink off. See also article on Summer Beverages in SCIENTIFIC AMERICAN SUPPLEMENT, No. 192.

(41) S. S. S. writes: I have a canvas and leather strop for stropping razors, but they don't put a keen edge on. What shall I put on to mend them? A. Razor paste is made as follows: Mix fine emery intimately with fat and wax until the proper consistency is obtained in the paste, and then rub it well into the leather strop. Prepare the emery by pounding thoroughly in a mortar the coarse kind, throwing it into a large jug of water, and stirring well. Immediately the large particles have sunk, pour off into a shallow plate or basin, and let the water evaporate. Another receipt is, levigated oxide of tin, prepared putty powder, 1 ounce, powdered oxalic acid ¼ ounce, powdered gum 20 grains; make into a stiff paste with water, and evenly and thinly spread it over the strop. With very little friction this paste gives a fine edge to the razor, and its efficiency is still further increased by moistening it.

(42) B. B. ask for a mixture that will clean rags that have been used in wiping off oil. A. Boil the rags with a dilute solution of caustic soda, and then wash in water to make them perfectly free from chemicals. 2. How wood filling is made of oil and corn starch? A. For porous hard woods, a filler is made by using boiled linseed oil and corn starch stirred into a very thick paste; add a little japan, and reduce with turpentine. Add no color for light ash; for dark ash and chestnut, use a little raw sienna; for walnut, burnt umber and a slight amount of Venetian red; for bay wood, burnt sienna. In no case use more color than is required to overcome the white appearance of the starch, unless you wish to stain the wood. The filler is worked with brush and rags in the usual manner.

(43) G. W. S. asks: What can I coat a muslin bag with so that it will be air tight and pliable, that it may be readily rolled when not inflated? A. Take 1½ ounces of India rubber, cut small, and of chloroform, ether (washed), or carbon disulphide, 1 pint; digest in the cold until solution is complete. Dries as soon as it is laid on. Pure gutta percha may be substituted for India rubber.

(44) J. S. McL. asks how the letter press printing plates are made of celluloid. A. The process is patented and the property of a company. It is partially secret also. 2. Is there a liquid solder that will solder metal plates together without the use of a hot soldering bolt? A. A so-called liquid solder is prepared as follows: Feed hydrochloric acid all the small pieces of zinc it will eat, dilute with equal amount of water, and it is ready for use.

(45) E. G. P. desires a receipt for whitening a helmet covered with white cotton cloth, something that will not rub off. A. There is no preparation for the purpose, but among individuals chalk is used frequently to cover over defects. A little pipe clay likewise might be used.

(46) S. J. H. asks for some means by which the odor of a new refrigerator can be gotten rid of. I have tried charcoal, but without relief. Water, butter, and milk suffer most, but other things more or less. A. There is no very satisfactory means that we can recommend for this purpose. A vessel filled with water or milk will absorb odor about as quickly as anything. The refrigerator should be lined with metal, and that thoroughly washed. 2. What will destroy currant worms? A. See the plan recommended in SCIENTIFIC AMERICAN SUPPLEMENT, No. 242, under title of "Currant Worms." See also "Black Ants as a Cure for Currant Worms," given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 316. 3. Will remedy for currant worms be efficacious in destroying slugs on a rose bush? A. Sprinkling beds of vegetables and flowers with a weak solution of chloride of lime is said to effectually preserve them from caterpillars, slugs, etc.

(47) J. A. J. wishes to have full particulars of how to cover copper wire with gutta percha and cotton, etc., also how to construct a cheap machine to do the same. A. The copper wire is drawn through vessels containing the guttapercha in a melted condition. A sufficiency of this material adheres to the wire as it cools. It is then passed through suitable dies, in order to give proper shape and thickness. There are several modifications of this general process, and the entire manipulation is patented.

(48) S. T.—We know of no mineral glaze that is pliable.

(49) J. M. S.—For cleaning a running engine, use tripoli or rotten stone with kerosene oil. If the hollow places get gummy, use a stick dipped in the mixture. Sometimes it is necessary to use emery cloth or flour of emery on neglected parts. After once getting your engine clean, the less emery you have around the better. If you wipe and clean every day, use only a little whiting wet with kerosene. If you use mineral oil for lubricating, you may need but very little polishing powder of any kind. Use only whiting on the brass.

(50) T. C.—The "invention" you mention as having been recently brought out by an exhibition company for producing tableaux, etc., was fully described by us some twelve years ago, as Pepper's ghost. The real figure, which is not seen by the observer, is seated below the stage, in the light of a strong lamp, and facing a mirror, while above the figure is a piece of plate glass, both mirror and glass being placed at an angle of about 45°. The ghostly image or reflection is then seen by the observer apparently above and behind the real figure.

(51) J. W. B. asks (1) how to make a Grenet battery. A. Procure two plates of zinc two inches by six, and four plates of carbon of the same size, and two jars adapted to receive them. Amalgamate the zincs, place one zinc between two carbon plates in each cell, and separate the carbons from the zinc by means of rubber or wood; the distance should be ¼ inch. Place in each cell a bichromate solution which you will find described in recent Notes and Queries. Connect the zinc of one cell with the carbons of the other, and connect the remaining carbons and zinc plates with your lamp; arrange the elements so that you can readily plunge them into or withdraw them from the solution. 2. How to make an electro magnet, and if No. 20 of cotton insulated wire would do? A. For instructions on electro-magnets consult SUPPLEMENT, No. 182, in which you will find a great variety of forms described. Cotton insulated wire will do. 3. Could old insulated wire (cotton covered) be made good by running it through melted shoemaker's wax, leaving a thick coat over the cotton? A. Old insulated wire will answer; better coat it with beeswax or with paraffine.

(52) C. L. M. asks: Which side of a belt should be run on the face of a pulley—the grain or flesh side? Which will develop the most power, and why? A. All the best belt makers say, run grain side to the pulley, and it is claimed that 33 per cent more power can thus be transmitted than with the flesh side next the pulley. The grain of the leather has a velvety surface, which enables it to hug the pulley closer than will the hard flesh side. Some users run the flesh side to the pulley for small belts, and then daub and stick up the belt with beeswax or resin to make it take hold, but this is not economical for the life of a belt, is unworkmanlike, and there is always more or less fussiness in running machinery where the belts are so treated, instead of their running for years without any attention, as they will sometimes do when run grain side to the pulley, and of proper size to transmit the desired power.

(53) E. J. S.—The Waterbury watch was invented by Mr. D. A. A. Buck, who also built an engine so small that, with boiler, governor, and pumps, it would stand on a gold dollar. It was 5/8 inch high, had 148 separate pieces, held together by 52 screws, and 3 drops of water were required for the boiler. Diameter of cylinder one-sixteenth inch, stroke three thirty-seconds inch, total weight 15 grains.

(54) J. C. T. asks: Will a spring, if it is held in tension, lose its elasticity if it not used? Take for example a spring door hinge held either open or shut for a year at a time, and not used in that period, would the spring have lost much of its strength? What is the best metal to make springs of for that purpose, and how long would they probably retain their elasticity if strained in either direction? A. Hardened steel springs retain their elasticity under restraint for many years. Brass springs weaken.

(55) H. H. L.—An electric current must have both quantity and intensity to kill an individual. We do not believe there is any practical way of glazing porous paper so it will take ink, except by the use of size, as paper manufacturers do.

(56) H. P. B.—No insulation for magnetism has been discovered. A substance for this purpose might find some applications which would render it valuable.

(57) W. H. B.—The pitch of screws is a matter of study in regard to the lines of the boat. The narrow, fine lined boat will allow of greater pitch than a blunt, wide boat. The proposed speed of screw and boat are also essential elements in the computation. Screws vary in pitch from one and a half to twice their diameters. You will find interesting details in regard to power, velocity, and form of screw propellers in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 370, 101, 272, 15, 208, and a book on screw propulsion, by Walker, 75 cents, which you may obtain through this office.

(58) G. M. G. asks: 1. What pressure is a steam trap for returning water from heating coils, etc., to the boiler liable to? A. The boiler pressure. 2. What pressure or strain is it liable to besides the regular boiler pressure? A. None, by its proper use.

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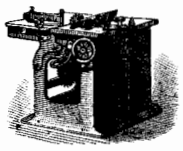

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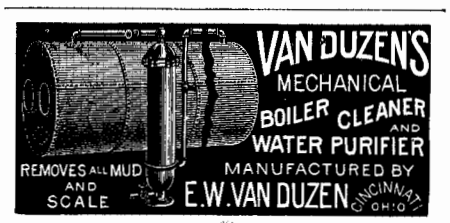

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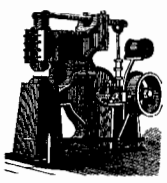

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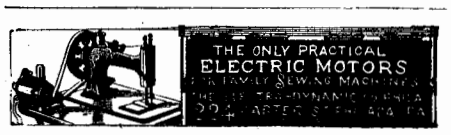

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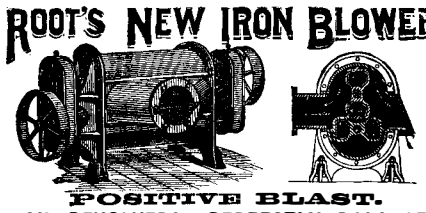

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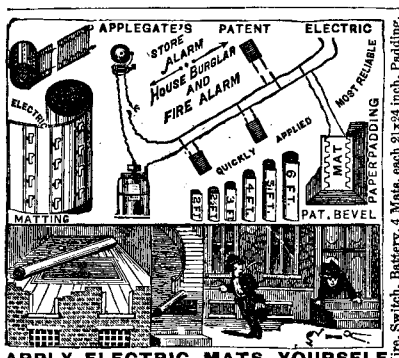

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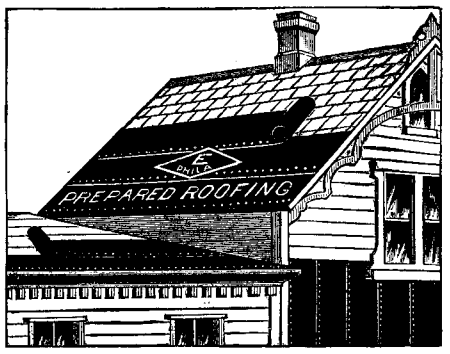

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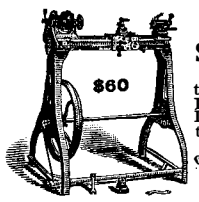

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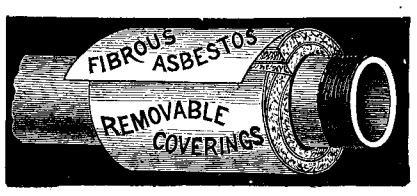

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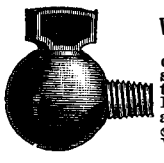

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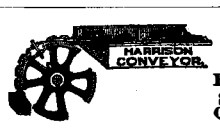

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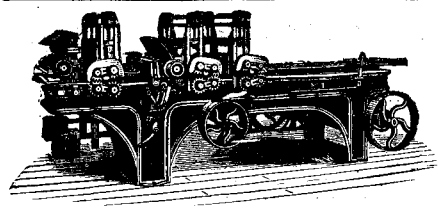

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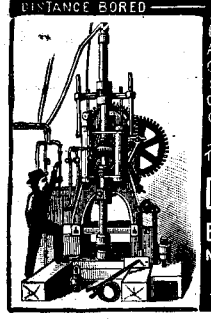

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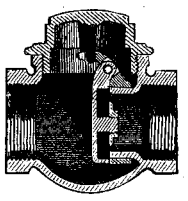

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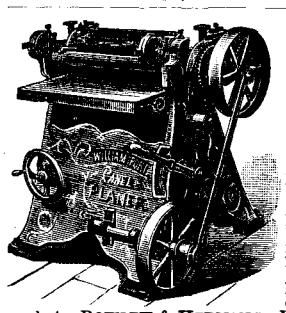

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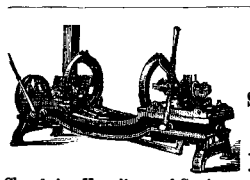

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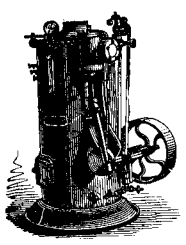

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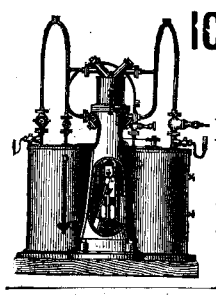

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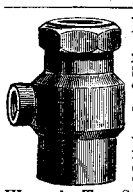

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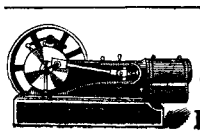

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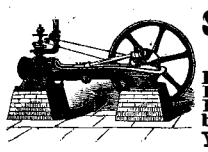

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